

THE TREATMENT OF BINGE-EATING DISORDER

**THE TREATMENT OF BINGE-EATING DISORDER:
WHAT ARE THE DETERMINING FACTORS IN CHOOSING AND IMPLEMENTING
THE MOST APPROPRIATE AND EFFICACIOUS THERAPEUTIC INTERVENTIONS
IN BINGE-EATING DISORDER?**

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THE TREATMENT OF BINGE-EATING DISORDER


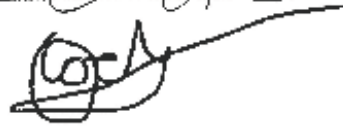

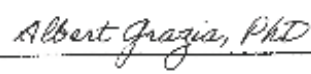
THE TREATMENT OF BINGE-EATING DISORDER: A LITERATURE REVIEW. WHAT ARE THE DETERMINING FACTORS IN CHOOSING AND IMPLEMENTING THE MOST APPROPRIATE AND EFFICACIOUS THERAPEUTIC INTERVENTION IN BINGE- EATING DISORDER (BED)?

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Approval of the Dissertation

This Dissertation, by Sandra Panattieri, has been approved by the committee members below, who recommend it be accepted by the University of Bridgeport, College of Health Sciences in partial fulfillment of requirements for the degree of Doctor of Health Sciences (D.H.Sc.)

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Abstract

Binge Eating Disorder (BED) is a serious health issue causing psychological and emotional distress, binge eating episodes, depression, body image issues, weight loss or weight gain, gastrointestinal issues, and social and relationship disturbances. BED is treatable using the three cornerstone methods that must be implemented long-term to recover. The three cornerstone treatments are psychotherapy, pharmaceutical therapy, and nutrition meal plans. There are other natural agents and therapies that can be used together with the three cornerstone treatments which are supplements, natural agents, meditation, acupuncture, and physical activity.

The purpose of this dissertation was to determine which psychotherapies and pharmaceutical drugs work best in the recovery of BED. Psychotherapies were compared in this dissertation and it was found that Cognitive Behavioral Therapy (CBT) was shown to be the most effective in the recovery of BED. CBT was compared to Interpersonal Therapy (IPT) and Behavioral Weight Loss Therapy (BWL) { $P < .05$; odds ratios: BWL vs. CBT, 2.3; BWL vs. IPT, 2.6; and CBT vs. IPT, 1.2}. The medications presented in this dissertation showed mixed results in the recovery of BED. Nutrition meal plans are recommended to all BED patients, however, there is no consensus on an optimal specific dietary plan for BED. The most effective nutrition plans appear to be foods that do not trigger cravings or spike blood sugar levels.

The trial outcomes were methodically segmented targeting high-risk populations that meet the criteria for BED. The most used outcome or assessment methods in the researched trials for psychotherapies were the Eating Disorders Examination Score and questionnaires. The most used outcome or assessment methods in the researched trials for medications were Clinical Global Impressions and the Hamilton Rating Scale for Depression.

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And to my mother in Heaven: I hope I made you proud by obtaining three degrees while raising my children and working to support them. You always said “get your education”, and I did. I just wish you were here to celebrate with me, but I know you are watching from heaven.

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A

THE TREATMENT OF BINGE-EATING DISORDER

Chapter 1

Background

Most people are familiar with eating disorders, such as anorexia nervosa and bulimia nervosa, but few people are familiar with binge-eating disorder (BED), despite its being the most common eating disorder in the United States. BED is a severe eating disorder characterized by repeated episodes of eating large quantities of food, which are usually eaten rapidly and which during the binge may bring on physical discomfort or feelings of loss of control, shame, guilt, depression, or distress. The cause of BED is unknown, but researchers are finding that there are psychological, biological, hereditary, and environmental factors involved (Mitchell et al, 2008, p.5).

Those who binge on food usually do so in private and are often triggered by a life event, loneliness, hurtful comments from others, a traumatic experience, the loss of a job or family member, depression, or embarrassment (Mazzeo & Bulik, 2009). Binges can happen at least once a week and may occur as often as every day. Individuals with BED usually binge on comfort foods, which can vary by individual. Unlike bulimia nervosa, those with BED do not purge their food after their binges. Those living with someone who has BED may find large amounts of food missing from the kitchen or find food hoarded in the individual's bedroom. They might also notice that they diet frequently, their weight fluctuates, they are preoccupied with their appearance and shape, their sex drive and self-esteem are low, and they constantly look in the mirror to pinpoint their flaws.

BED differs in important ways from anorexia nervosa and bulimia nervosa. Anorexia nervosa (AN) involves self-starvation, excessive exercise, and fast weight loss, and can be life-threatening since it affects hormones and organs over time. Bulimia nervosa (BN) involves

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binging on food, then purging the food through self-induced vomiting and/or the use of laxatives. Individuals with BN may also abuse weight-loss supplements and diet fads.

BED might be described as a combination of AN and BN, but without the purging. Individuals with BED will go long periods without eating in an effort to lose weight. When their hunger and cravings increase, they will binge on food but will not purge. The cycle of not eating, then binging, becomes regular.

Social Consequences

In addition to eating alone when binging, individuals with BED also appear to be uncomfortable eating around others. They avoid social events that include food and drink to avoid possible weight gain, and they become less social over time. Holidays are difficult for those with BED because they will either binge on their favorite holiday foods, disappear to binge privately, or disappear completely to avoid all food. This lack of socialization can affect their relationships with family and loved ones. It is difficult to reason with someone with BED because the disorder has a psychological side. Professional help is needed to overcome it, as well as support from family and friends.

Health Consequences

In addition to the psychological and social effects of BED, there are health consequences from long-term binge-eating. Due to their rapid eating and the large amounts of food they eat, individuals with BED usually experience gastrointestinal issues, such as bloating, gas, acid reflux, constipation or diarrhea, or digestive issues (Santonicola et al., 2019). When food enters the gastrointestinal (GI) tract, many signals arise from the gastric juices, and gut hormones are released from the enteroendocrine cells of the GI wall (Santonicola et al., 2019). Subsequently, the food empties out of the stomach into the small intestine, where a sensation of satiety usually

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results. Individuals with BED may not feel full after eating, usually because of the release of gut hormones from the GI wall, which results in a lack of satiety and an increase in appetite (Santonicola et al., 2019). The dysregulation of this physiological process can affect eating behavior and eventually provoke repeated GI symptoms over time.

Fluctuations in weight may cause obesity over time and may also result in metabolic syndrome and heart disease. According to *Eating Disorders Review* (“Obese patients,” 2012), “eating large amounts of food in a defined period of time is associated with increased fasting glucose levels, exaggerated insulin secretion, elevated lipid levels, and lowered glucose tolerance.” This may eventually result in a higher waist-hip circumference ratio and fatty liver in obese people. Also, an obese subject who has BED will be at a higher risk for a metabolic disorder or heart disease.

Affected Populations

Those at higher risk of suffering from BED include athletes, those who have experienced mental or emotional trauma, those who compete in bodybuilding competitions, and military personnel. Approximately 19% of women and 14% of active-duty military personnel meet the criteria for BED (Brubaker, 2018). The high incidence of BED in military personnel is due to either not having food available all the time or having to eat their food quickly because of their physical or environmental conditions. The stress and pressure of being in the military also add to their sporadic eating habits. Additionally, 65% of female veterans and 45% of male veterans have reported one or more episodes of binge-eating (Brubaker, 2018). The majority of these veterans are overweight, defined as having a body mass index (BMI) of 25–29.

Female athletes are more likely to have BED than male athletes because of the pressure on females to stay thin. Gymnasts, in particular, must stay lean and are pressured into avoiding

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snacks, party foods (e.g., pizza and cake), and overeating of any kind. When gymnasts can finally eat after a long-awaited competition, they often binge on foods they missed out on while in training. Female runners experience the same pressure and stress as gymnasts, as well as the same binges once their races are over with.

According to *Binge-Eating Disorder* (Mitchell et al., 2008, p. 24), frequent dieters can develop BED by skipping meals during the day, then binge-eating later in the day due to increased hunger. Skipping meals and binging on poor-quality foods can lead to nutrient loss or deficiencies. Other dangerous diets, such as fasting for more than three days, excessive use of laxatives, and an extremely low-calorie diet, can also lead to binging.

Some BED patients suffer from traumatic past experiences. Childhood traumatic experiences such as emotional, physical, mental, and sexual abuse are called Adverse Childhood Experiences (ACEs). In adult years, ACEs can lead to disordered eating, alcohol abuse, drug abuse, anxiety, depression, violence, and mental illnesses. Eating disorders can cause obesity, and obesity can in turn cause diabetes, heart disease, and physical limitations. The effects of ACEs leave a footprint of health issues through each stage of one's life. These negative experiences in childhood can lead to disrupted neurodevelopment, which can in turn impair one socially, emotionally, and cognitively. The disruption in neurodevelopment and said impairments can lead to the adoption of other health risks and behaviors, disease, disability, and even death (CDC, 2015).

There is increasing evidence that chemical imbalances in the brain can make some individuals more vulnerable to eating disorders. One of these chemicals is dopamine. A study was performed by Egerton et al. (2016) on sixty-seven young adults to find the relationship between ACEs and dopamine levels. Forty-seven of the participants in this study experienced

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either sexual abuse or physical abuse in childhood. Twenty of the participants were healthy volunteers. The authors, Egerton et al. (2016), found that ACEs increases the risk of psychosis in adulthood, and was associated with changes in dopamine levels. With regard to eating disorders, a decrease in dopamine levels can cause an increase in hunger as in those with BED and bulimia (NEDA Feeding Hope, 2018). An increase in dopamine levels can cause a decrease in appetite as in those with anorexia (NEDA Feeding Hope, 2018).

Dopamine levels in a baby's brain can fluctuate depending on the absence or presence of a parent. A study performed by Gabor (2012) on four-month-old monkeys has shown major changes in dopamine levels after six days of separation from their mothers. The monkeys also showed social-emotional dysfunction. Social and emotional stimulation is necessary for the growth of nerve endings that are responsible for releasing dopamine in the body (Gabor, 2012).

While it is imperative to intervene early when children experience an ACE, early intervention often goes unsought because the abuser is a family member (Dunne, 2017). Hidden abuse often goes unreported since some individuals may be afraid to admit being abused. Abusers often use threats or fear to control their victims. The following are some statistics given by Thehotline.org (2020) on percentages of childhood abuse and how much is reported:

- A child witnessed violence in 22% (nearly 1 in 4) of intimate partner violence cases filed in state courts.
- Thirty to sixty percent of perpetrators of intimate partner violence also abuse children in the household.
- There is a common link between domestic violence and child abuse. Among victims of child abuse, 40% report domestic violence in the home.

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- There is a common link between domestic violence and child abuse. Among victims of child abuse, 40% report domestic violence in the home.
- One study in North America found that children who were exposed to violence in the home were 15 times more likely to be physically and/or sexually assaulted than the national average.
- The U.S. Advisory Board on Child Abuse and Neglect suggests that domestic violence may be the single major precursor to child abuse and neglect fatalities in this country.

Treating ACEs in adulthood, however, can be very effective if proper therapy and lifestyle changes are administered. With BED, it is imperative to implement psychotherapy, medications (if necessary), good nutrition, physical activity, and other lifestyle changes, all of which will be discussed in this literature review.

Prevalence and Demographics

BED affects an estimated 1–3% of the general population (McCuren-Wurst et al., 2018). Those at higher risk of getting BED are women and those under the age of 30. BED affects people of all races, ethnic groups, and religions.

Other Factors: Environmental, Physiological, Biological, and Hormonal

Environmental factors can contribute to BED. Those who live with physically, mentally, or emotionally abusive spouses or caregivers can develop eating habits that lead to BED (Mazzeo & Bulik, 2009). If someone is being degraded or physically or emotionally abused, they might binge on comfort foods as a control mechanism. An example of this is some abusers may convince their victims that they are fat, which can set the stage for food restriction, followed by binging from hunger. In other cases, a teacher or coach tells a victim that they are not good

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enough (e.g., at playing a sport or getting into college). Binging on their favorite foods may help the abuse victim feel better temporarily, but feelings of guilt generally follow.

The physiological and biological factors that might provoke BED include changes in brain chemicals or hormone fluctuations. The hormone pramlintide may lead to binge-eating when its levels are high in the blood (American Physiological Society [APS], 2007). A study performed by the American Physiological Society (2007) included a total of 88 obese participants, of whom half were treated with pramlintide and half were treated with a placebo. The group given pramlintide showed a significant reduction in their calorie intake.

Researchers believe that when there are high amounts of ghrelin in the blood, people crave sugar and carbohydrate-type foods more often (Lavender et al., 2019). Ghrelin, a hormone produced in the gut, is termed “the hunger hormone”; its main function is to increase appetite. It travels through the bloodstream to the brain, which then tells the body that it is hungry and to eat.

Leptin is a hormone made by fat cells (adipose tissue) that is thought to decrease appetite. Leptin helps regulate energy expenditure and food intake by sending a message to the hypothalamus in the brain after each meal. Leptin is also involved in the long-term regulation of energy balance, body weight, reproduction, physical activity, and immune function, and can be involved in the dysregulation of the endogenous–endocrine axis (Lavender et al., 2019). It is believed that when leptin is decreased in the body, hunger increases, so the person eats more.

Leptin’s ability to reduce food intake strongly depends on the signaling of a gene called STAT3 (Bates et al., 2003). Signaling of leptin through STAT3 is required for homeostasis of glucose fluxes through leptin. Leptin regulates energy homeostasis and neuroendocrine function. Without it, diabetes, obesity, and impaired growth can occur (Bates et al., 2003). A study on mice performed by Bates et al. (2003) demonstrated that the activation of hypothalamic STAT3

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was needed for glucose metabolism, and also showed that lifelong obliteration of STAT3 (via the leptin receptor) resulted in hepatic insulin resistance. This study included healthy mice who did not have diabetes.

Insulin is a hormone that controls blood glucose levels. There is not a direct relationship between insulin, diabetes, and binge-eating disorder, however, there is an indirect relationship with fluctuating blood glucose levels and binge-eating. When a person skips meals, their blood glucose drops, and their hunger increases substantially (Goebel-Fabbri, 2008). An individual with BED might binge during this time.

Going beyond hormones, stress can trigger neuroendocrines that are involved in the regulation of homeostasis, which are the same neuroendocrines that signal hunger and satiety (Lavender et al., 2019). Increased hunger and not feeling full are signal malfunctions that can lead to bingeing. This occurs when the dopamine system disrupts messages to the brain. The central dopaminergic mechanisms are involved in the motivational aspects of eating and food choice (Bello & Hajnal, 2010). According to Bello and Hajnal (2010), during the active phase of binge-eating, dopamine metabolites increase. However, before dopamine is enabled, DOPA decarboxylase is first needed to activate levodopa (L-DOPA) and dopamine (Montioli et al., 2016). DOPA decarboxylase is a protein found in the body and enables the conversion of levodopa (L-DOPA), then L-DOPA is converted into dopamine. L-DOPA is also used in the treatment of Parkinson's disease, since those with Parkinson's have a lack of dopamine in their brain (Montioli et al., 2016). If there is a problem with DOPA decarboxylase, it will stop working outside of the brain.

A review on dopamine by Bello & Hajnal (2010) found that highly palatable foods (sugars, fats, and a combination of both) resulted in sustained dopamine stimulation. This same

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stimulation occurs in substance abuse/addiction and eating disorders. The authors also suggested that the sustained stimulation of the dopamine systems by binge eating disorder was promoted by pre-existing conditions such as stress, hereditary trait, and dietary restrictions (Bello & Hajnal, 2010). These conditions can impair dopamine signaling.

Multiple factors can regulate food intake such as caloric requirements, dopamine levels, serotonin levels, insulin, and other feeding behaviors. Studies reviewed by Wang et al. (2011) found consistent results with dopamine's role in regulating food consumption through rewarding properties. They found that low dopamine activity could predispose an individual to overeat as a way of compensating for decreased dopaminergic activity. Those with BED share similar compulsive and impulsive behaviors with food. Some ingredients in palatable food (i.e., sugar and fat) can result in an impulsive intake of food. This behavior can also induce the release of dopamine.

It is believed that investigating the interactions of neuromodulators and neurotransmitters with dopamine signaling pathways may reveal the cause of binge-eating behaviors concerning physiological needs (Bello & Hajnal, 2010). The same dopamine pathway events also occur in those with anorexia and bulimia (Bello & Hajnal, 2010).

Two genes, C57BL/6 and FMRI-interacting protein (CYFIP2) have been identified as having a heritable effect on BED (Kirkpatrick et al., 2016). The research shows how these genes can affect binge-eating behaviors when certain changes in the brain cause a decrease in myelination. These changes in the brain have been detected in those with BED. Researchers believe that they can eventually provide a behavioral paradigm for future associations with this genetic factor (Kirkpatrick et al., 2016).

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Another gene (genetic receptor) being researched by scientists is N-methyl-d-aspartic Acid (NMDA) in the possible treatment of BED. NMDA has been linked to addiction-related behaviors in individuals with BED (Smith et al., 2015). NMDA is not fully understood yet, but one study to be discussed, by Smith et al. (2015), aimed to characterize the effects of the NMDA receptor antagonist (called memantine) on food-induced behavioral adaptations in rats.

Diagnosis

To diagnose BED, a physician will generally recommend a psychological evaluation, which will include the patient's eating habits. The physician may evaluate blood pressure or order tests of serum cholesterol, blood sugar, and nutrient levels. They will also evaluate a patient's medical history, including questions about symptoms of gastrointestinal issues, headaches, sleep disorders, depression, anxiety, and overall self-esteem (Tartakovsky, 2019).

The physician can diagnose once the tests have been administered and evaluated along with the history and a physical examination. Family members might also be able to identify signs the patient may be displaying (objective signs) that are consistent with BED. Objective signs are hoarding food, avoiding social events, withdrawing from activities, constantly looking in the mirror, dwelling on weight and appearance, and frequent dieting.

The Eating Recovery Center in Denver (2018) suggests that each individual with potential BED answers the following questions to identify BED signs and symptoms. According to the Eating Recovery Center in Denver (2018), if an individual responds "yes" to any of these questions, a patient might have BED:

1. I feel out of control around food.
2. I sometimes eat until I feel sick or uncomfortable.

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3. I am worried about my weight and body shape.
4. I use food as comfort.
5. I have gained more than 15 pounds in the last 12 months.
6. I feel addicted to food.
7. I binge on food regularly.
8. I eat mindlessly throughout the day or night.
9. I am struggling with my poor relationship with food.

Immediate Need for Help

BED must be taken seriously and addressed as early as possible because of all the mental and physical health issues it causes. The first choice of treatment for people with BED is cognitive-behavioral therapy (CBT). Cognition comes from the Latin word “cognoscere,” which means “to recognize.” The idea of CBT is to form a clear idea of one’s thoughts, attitudes, and expectations (Institute for Quality and Efficiency in Health Care [IQEHC], 2016). The ultimate goal of CBT is to reveal and change thoughts that are distressing and false and understand that these thoughts cause problems when one is attached to them (IQEHC, 2016). Individuals with BED experience distressing thoughts about their weight and appearance, and they suffer from low self-esteem. Some individuals have dangerous thought patterns that cause them to draw negative conclusions. This is where the individual may become antisocial and withdrawn from family and friends. CBT helps patients replace these thoughts and feelings with more realistic and less harmful thoughts and feelings (IQEHC, 2016). CBT also helps individuals with BED think more clearly and realistically, thus teaching them to control their thoughts better.

Behavioral therapy, in general, may help a patient reduce anxiety resulting from their negative thoughts, learn to create deviations to their poor habits, and find ways to become active

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and social again (Crow, 2014). One example of a deviation is to work on a hobby when having negative thoughts. Behavioral therapy is not something that has a timeframe; it takes time to get results and is a daily task in progress (i.e., it requires daily management).

Another therapy used in BED patients is interpersonal psychotherapy (IPT), which usually consists of repeated sessions (6–20 sessions). The goal of IPT is to work with the patient's low self-esteem, distress, anxiety, and any other feelings that trigger binge-eating episodes. The IPT therapist helps the patient find a link between their relationship to food and their symptoms. The patient chooses to focus on one of four problem areas: grief, interpersonal role disputes, role transitions, or interpersonal deficits (IQEHC, 2016). An example of IPT is helping a client transition into single life from a marriage (i.e., after a divorce).

Dialectical behavior therapy (DBT) may also help treat BED. DBT was originally designed to treat patients with borderline personality disorder and those who are repeatedly struggling with suicidal thoughts or attempts. A DBT therapist helps a BED patient identify what exactly triggers the binge-eating episodes, then teaches the patient how to manage these emotions without binge-eating. During DBT therapy, the patient also learns how to build a fulfilling and meaningful life.

Antidepressants (e.g., fluoxetine [Prozac]) are used to treat BED since most BED patients also become depressed. Prozac is a selective serotonin reuptake inhibitor (SSRI) that inhibits the reabsorption of serotonin, thus increasing the availability of this neurotransmitter. Serotonin (5-hydroxytryptamine or 5-HT) is a chemical that in the human body performs many functions, one of which is to contribute to feelings of well-being and happiness. Other antidepressants that treat BED are sertraline (Zoloft), citalopram (Celexa), fluvoxamine (Luvox), and escitalopram (Lexapro). The antidepressant doses vary by patient, and they have side effects, such as

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drowsiness, nervousness, dizziness, numbness in the hands or feet, problems with coordination, confusion, and issues with speech and memory (Crow, 2014). Topamax is another drug used in the treatment of BED, but it is not an antidepressant. Topamax is used to treat migraines but is also claimed to reduce appetite substantially. Lisdexamfetamine (Vyvanse) is a drug that normally treats attention deficit hyperactivity disorder (ADHD) but may also help individuals with BED because of its ability to control compulsive behaviors.

In addition to cognitive therapy and medication, individuals with BED need to implement structure in their personal lives. This includes a supportive family, friends who are understanding and caring, hobbies on which to focus, and other healthy habits, such as physical activity or meditation.

Purpose of the Research

The purpose of this research was to explain what BED is and further its understanding. Many people are familiar with eating disorders anorexia and bulimia but do not understand binge-eating disorder. With BED being the most common eating disorder in the United States, it is important to recognize its signs and get help when necessary. This dissertation investigated current and potential treatments for BED. Different sections identified the positive and negative effects of each treatment. Other sections explained the importance of the three cornerstones of treatment (psychotherapy, medication, and nutrition).

Research on supplements, natural therapies (e.g., botanical medicine), and physical activity will be reviewed and explained. Supplements, natural therapies, and physical therapy are not standard primary treatments for BED but may nonetheless aid in the recovery from such a complicated illness.

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Raising awareness of BED will be discussed in this dissertation since most people do not know its signs and symptoms, and recognizing them early will allow clinicians to help others sooner. There is much pressure on young aspiring athletes to be fit, lean, and strong. Physical appearance can be damaging to self-esteem and thus lead to obsessive behaviors (like BED). Awareness can be raised in local schools, community centers, and health facilities.

Based on the current evidence identifying BED as the most common eating disorder in the United States, a major goal of this dissertation was to review the treatments, implications, and action plans for BED. Other research questions explored include:

1. What are the current and future implications of increasing awareness of BED?
2. What are the recommendations for therapeutic approaches to BED?
3. What are the overlapping genetic factors and mechanisms that explain BED?
4. Should there be screening for BED?
5. What does the research reveal about BED patients' substance abuse?
6. Taking into consideration what we know now about BED, how can future research take advantage of developing effective strategies for the progressing stages and treatments of BED?

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Chapter 2

Literature Review

Psychological Treatments

There are several psychological treatments for BED: cognitive behavioral therapy (CBT), interpersonal psychotherapy (IPT), behavioral weight loss therapy (BWL), and dialectical behavior therapy (DBT). All of these treatments offer different approaches to decreasing binge-eating episodes and changing how BED patients feel and think. The research showed that CBT and IPT are the most studied and well-established psychological treatments for BED because they result in abstinence rates higher than those associated with no treatment at all (Iacovino et al., 2012). These treatments are also very effective for patients with BED because they help them overcome their negative thoughts about themselves and their bodies and teach them to create positive thoughts and actions (Iacovino et al., 2012).

A large study conducted by Wilfley and colleagues (2002) compared 20 sessions of groups using either the CBT or IPT format (N=162) to compare the effects of both treatments concerning reduced binge-eating episodes. After the initial 20 sessions, (64 {79% } of 81 vs. 59 {73% } of 81) of the participants were abstinent from binge-eating, and (48 {59% } of 81 vs. 50 {62% } of 81) were still abstinent at their 1-year follow-up. Eating restraint decreased along with some weight loss in CBT, but IPT showed the same eating habits with little weight loss. However, both treatments showed long-term efficacy for the core symptoms of BED (i.e., binge-eating). The methods in this study were questionnaires given to each participant, and follow-ups were given at 6 months and 12 months. The study exclusions were pregnant women, lactating women, and anyone with underlying diseases (e.g., diabetes, heart disease, or cancer). A possible weakness of this study is that self-assessments can sometimes create a lack of

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accountability and may lead to undesired outcomes. Undesired outcomes can create different results.

Another study by Dingemans et al. (2007) comparing 15 sessions of CBT and BWL reported that CBT had superior abstinence rates to BWL with decreased bingeing. This randomized controlled study (N=52) had a wait-listed control group to compare the effectiveness of the treatment. Neither treatment outcome at the 1-year follow-up could be predicted by the severity of BED or comorbid psychopathology (Dingemans et al., 2007). However, at the 1-year follow-up, the participants still showed a reduction in binge-eating episodes and body image concerns, but researchers were unable to identify a coping style (how the subjects maintained their decreased bingeing). Generally, maintenance includes continuing psychotherapy, adding group therapy if necessary, and/or continuing to take the recommended medication (Dingemans et al., 2007). The study left out their coping styles, which can be classified as a weakness of the study. A reduction in binge-eating episodes and body shape concerns, however, are strong outcomes of this study.

Another study examined the efficacy of CBT combined with drug treatment using fluoxetine (Devlin et al., 2012). BED patients (116 overweight/obese men and women) received 16 sessions of CBT. There were random assignments of CBT plus fluoxetine, or CBT plus a placebo. Overall, all subjects showed an improvement in binge-eating episodes but little weight loss. The group given fluoxetine showed a 62% reduction in binge-eating, plus a substantial reduction in depression. The group who received the placebo showed a 33% reduction in binge-eating. The study showed that CBT helped the participants improve their binge-eating episodes but, together with the fluoxetine, also helped them improve their mood. All participants were weighed before treatment started, then weighed again at the end of the 16-week sessions. There

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was some weight loss in both groups, but a not substantial one. Self-evaluations were provided to each participant during the 16-week session. In some cases, self-evaluations can be subjective when the participants' results are affected by how they are feeling rather than what is actually happening (Crow, 2014).

CBT, IPT, and BWL all have different approaches. A randomized study was performed on 205 overweight and obese women and men with BED who had a BMI of 27–45 (Wilson et al., 2010). “Overweight” is defined as having a BMI of 25–29, and “obese” is defined as having a BMI of 30 or higher. Over 6 months, this large study group received either 20 sessions of IPT or BWL or 10 sessions of CBT. The groups were revisited after 2 years, and it was reported that both CBT and IPT therapies resulted in reductions in binge-eating and greater remission rates than did BWL ($P < .05$; odds ratios: BWL vs. CBT, 2.3; BWL vs. IPT, 2.6; and CBT vs. IPT, 1.2). BWL helped with self-esteem only. This study showed that IPT and CBT are more effective than BWL. Guided self-help (i.e., BWL) is a treatment option for BED, but IPT and CBT will help patients further towards recovery by helping them change their behaviors and negative feelings toward themselves. The models used were Eating Disorder Examination scores and questionnaires on self-esteem. There were some dropouts, but those who remained in the study showed promising results for binge reduction. However, there were some limitations. One was the research performed in two different eating disorder clinics, which makes it more difficult to determine the generalizability of the findings. Research should be performed in a clinical care facility (not a clinic) because the staff in a clinical care facility will have the appropriate training for evidence-based treatments (Wilson et al., 2011). The study did not mention how many staff members or therapists were performing the treatments in both clinics.

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Several researchers analyzed CBT, IPT, BWL, and DBT (Devlin et al., 2012). They reviewed all four psychological treatments for BED (CBT, IPT, DBT, and BWL) and found a total of 233 published studies to analyze. The search databases used were Medline, PubMed, PsychINFO, and Science Direct. Their review supported the effectiveness of CBT and IPT, particularly for those with higher incidences of bingeing and general psychopathology. DBT showed some reduction in patients' concerns about their shape. DBT helps patients work out their problems and work on relationships with others but does not directly help with compulsive habits (Devlin et al., 2012). BWL, a self-guided weight loss program where the patient receives nutritional advice and a meal plan designed to help him or her lose weight (i.e., make lifestyle changes), was less effective for reducing binge-eating but was shown to help increase self-esteem. BWL needs further research since it does not directly target psychological issues related to BED.

Since CBT and IPT seem to be the most effective psychological treatments for BED, these two therapies should be recommended first to patients. DBT and BWL require further research regarding their use with and without other therapies.

A 20-week study was performed by Telsh et al. (2001) using DBT on 44 women who were randomly assigned to either DBT (N=18) or a wait-listed control condition. The testing tools were the Eating Disorder Examination, taking weight at baseline, and recording their mood. The results showed that 89% of the women had stopped binge-eating by the end of the treatment. The overall results for weight loss and mood, however, were not significant. Follow-ups were every 3 months for the first year, then every 6 months for the second year. Only three women were treated with medication for major depression, however, most women suffered from anxiety disorder, psychotic disorder, or major depression, as well as BED. Despite these varied

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conditions, the results of using DBT as a treatment were still positive. One limitation of this study was the omission of information about whether these 18 women were receiving other psychological therapies, such as CBT or IPT, as well as DBT. A positive outcome was its high abstinence rate (89%) and few drop-outs.

Iacovino et al. (2012) explained BWL as a weight-loss program designed to decrease energy intake and increase energy expenditure through changes in dietary habits and lifestyle. The changes in diet and lifestyle are gradual but require self-monitoring of food intake, exercise, and thoughts about food. A review performed by Iacovino et al. (2012) on BWL found that the majority of individuals with BED struggle with obesity, being overweight, and/or having a higher BMI than those without BED. Since BWL is commonly recommended to obese individuals, it is hypothesized that improved eating habits and exercise will result in weight loss and less binge-eating. Their review showed that BWL is not as effective as other psychological treatments for BED for binge-eating, and that CBT was associated with significantly higher abstinence rates than BWL. The studies reviewed were all randomized controlled trials. The inclusion criteria were obese individuals, obese individuals with diabetes or heart disease, anyone with any eating disorder, and anyone who met the criteria for the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). All eating disorders are classified in the DSM-5, which is a handbook used by healthcare professionals in the United States. It contains disorders, descriptions, signs and symptoms, and other criteria for diagnosing mental disorders.

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Pharmaceutical Treatments

Several drugs are prescribed to treat BED. The effects of these drugs are a reduction in depression and compulsive behaviors and a decrease in binge-eating episodes. If binge-eating episodes decrease, the patient may lose weight and decrease their BMI. The prescription drugs do not directly cause weight loss; instead, weight loss is the result of the reduced bingeing. Prescription drugs are strongly recommended, together with psychotherapy, to fully help the symptoms of BED and treat the illness (Eisenberg, 2016).

Acamprosate. Acamprosate is an oral medication used with some BED patients to decrease their binge-eating episodes since its main mechanism of action is to help balance the chemicals in the brain responsible for addiction and compulsion. Acamprosate is normally used for the prevention of relapse in alcohol dependence (Kalk & Hughes, 2014). It works by decreasing the withdrawal symptoms that cause cravings and negative reinforcement. Acamprosate is not protein-bound and is dissociated in plasma. It is not metabolized and is excreted unchanged in the urine. Acamprosate can indirectly cause renal impairment from increased plasma concentrations, however, it can be contradicted with other medications that are excreted through the kidneys (Kalk & Hughes, 2014). Common side effects of acamprosate are feelings of sadness or emptiness, fear, and severe depression. More severe side effects are abdominal pain, confusion, dry mouth, diarrhea, headache, increased urination, and a metallic taste in the mouth (Crowe, 2014).

In a 10-week, randomized, placebo-controlled trial performed by McElroy et al. (2011) with acamprosate (N=20) or placebo (N=20), acamprosate was not associated with a significant reduction in binge-eating episodes. It did, however, show a slight decrease in weight BMI, and food cravings in both groups. A dosage of 666 mg three times a day was used. There were

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many exclusions in this trial, including pregnancy, a history of mania or dementia, a history of seizures, the use of other psychiatric medications, cancer, and anorexia or bulimia. Whether the participants in the trial were receiving psychological therapy along with acamprosate was not mentioned. Not knowing whether the participants received psychotherapy makes it difficult to determine whether acamprosate alone could help improve the behavior of subjects with BED. This study showed a small decrease in weight and BMI, however, it deserves further research.

The work of Kalk & Lingford-Hughes (2012) helped explain acamprosate and its acclaimed effect of reducing cravings. Acamprosate is slow-releasing once ingested or injected. It takes about four days to begin to take effect. Acamprosate decreased signs of alcohol withdrawal, such as hypermobility and anxious behavior, when tested on rodents (Kalk & Hughes, 2012). This decrease in behaviors was due to acamprosate preventing the increase in glutamate in the nucleus of rodents with chronically high alcohol levels during the withdrawal phase (Kalk & Lingford-Hughes, 2012). The doses given to the rodents were 50 mg per day. The reduction in cravings from acamprosate has not yet been researched in humans. Acamprosate has side effects, the worst of which is renal impairment (Crow, 2014). Other minor side effects are diarrhea, flatulence, headache, and fatigue.

Escitalopram. Escitalopram is an oral antidepressant drug in the SSRI class that helps reduce anxiety and depression. Escitalopram is the S-isomer of the compound citalopram, another SSRI that will be discussed in this chapter as well. Escitalopram is metabolized by three cytochrome P450 (CYP) hepatic enzymes: CYP2C19 (36%), CYP2D6 (30%), and CYP3A4 (34%). With three routes of biotransformation, a drug interaction is unlikely to affect the overall clearance rates (Culpepper, 2002). Escitalopram is 55% bound to plasma proteins, which can also reduce the potential of drug interactions.

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Escitalopram was tested in a study performed by Guerdjikova et al. (2008) in doses of 20–40 mg per day (the mean dose was 26.5 mg per day). This study was a double-blind, placebo-controlled trial (N=21 and N=23) that lasted 12 weeks. The results reported that escitalopram and the placebo showed similar rates of reduction of the binge-eating episodes and obsessive-compulsive behaviors of BED. Escitalopram, however, showed a much higher reduction in weight, BMI, and severity of the illness. There were no changes in hormone levels (ghrelin or leptin). Since the researchers monitored hormones, this information can be helpful to subjects with hormone imbalances. Participants taking higher doses of escitalopram had better results than those taking lower doses in this trial (26.5 mg – 40 mg). Those excluded from this study were pregnant and lactating women, those with psychological disorders other than depression, and cancer patients. This study provided a positive outcome in subjects who desired weight reduction, a decrease in BMI, and a reduction in the severity of BED. However, the authors did not state whether depression or anxiety was decreased in patients. This could be a weakness of the study since the primary use of escitalopram is to reduce depression and anxiety. Also, the authors did not test this drug in combination with psychological therapies for BED, and further research should be performed on that combination. Research suggests that, without psychotherapy, a BED patient cannot learn to redirect their negative feelings (Crow, 2014).

In the book, *The Treatment of Eating Disorders: A Clinical Handbook* (Grilo & Mitchell, 2010), seven trials were discussed and reviewed on BED patients who took escitalopram, fluoxetine, sertraline, and citalopram. One of the trials reviewed by Grilo & Mitchell (2010, p. 405) has shown that escitalopram was superior to the placebo at decreasing BMI but not at decreasing binge-eating frequency. Escitalopram seemed to work better than fluoxetine and sertraline for weight loss, but not as well as citalopram. The authors also found that fluoxetine,

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sertraline, and citalopram help reduce depressive symptoms, but not escitalopram. The authors chose trials that were at least 10 weeks long, with participants who had no psychological issues other than depression. However, not all participants in these studies received psychotherapy. The three cornerstone treatments usually recommended in the recovery from BED are psychotherapy, medication, and nutrition.

In conclusion, escitalopram needs further research since only one study by Guerdijkova et al. (2007) found it to be effective for weight reduction and a decrease in BMI. More studies should be compared to develop a stronger conclusion.

Fluoxetine (Prozac). Fluoxetine is an SSRI and a potent inhibitor of cytochrome P450 (CYP-2D6) and neuronal serotonin reuptake. Fluoxetine's expected benefits are a reduction in depression, a reduction in binge-eating episodes, and the promotion of weight loss. Overdose or prolonged use can lead to the desensitization of somatodendritic 5-HT, a type of serotonin receptor found in the nervous system (de Boer & Koolhaas, 2005). The side effects of fluoxetine are dry mouth, nausea, headache, dizziness, drowsiness, and sexual dysfunction. Fluoxetine therapy can be associated with elevations in serum aminotransferase levels and linked to acute liver injury (de Boer & Koolhaas, 2005). Drug interactions with fluoxetine are Adderall, amitriptyline, bupropion, buspirone, phentermine, tramadol, vyvanse, and wellbutrin.

Studies performed on fluoxetine in combination with CBT show varying results. One randomized double-blind study by Grilo et al. (2004) included 108 patients in a 16-week treatment of fluoxetine (60 mg per day). There were four groups: fluoxetine only, placebo only, fluoxetine plus CBT, and placebo plus CBT. Of the 108 patients with BED, 80% completed treatment. Remission rates (which was zero binges for 28 days) for those who completed the study were 29% (fluoxetine), 30% (placebo), 55% (CBT + fluoxetine), and 73% (CBT +

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placebo). Weight loss was modest for all treatments but it was associated with binge eating remission (Grilo et al., 2004). Follow-ups and self-evaluations were performed throughout the study period. In conclusion, CBT (not fluoxetine) demonstrated efficacy for changing the behaviors of BED but not obesity.

Another study performed by Arnold et al. (2002) included fluoxetine for 6 weeks (N=60), with a dosage of 20–80 mg per day of fluoxetine (N=30) and placebo (N=30). BMI and weight were taken at weeks 1 and 6. The measurement tools used were Clinical Global Impressions (severity of illness score) and the Hamilton Rating Scale for Depression (HAM-D). Compared with the placebo group, the subjects receiving fluoxetine (mean +/- endpoint dose = 71.3 +/- 11.4 mg/day) had a greater reduction in binge-eating episodes ($p = .033$), BMI ($p < .0001$), and weight ($p = .001$) after the 6-week trial. The participants in this study did not receive psychotherapy. One weakness of this study was that the participants self-recorded their progress (or lack thereof) for the entire 6 weeks. Self-reporting can allow for dishonesty regarding progress and the inaccurate outcome of the data. The main purpose of this study was to see whether fluoxetine helped decrease the severity of the illness. This question was not answered and therefore could be a limitation of this study.

The two aforementioned studies on fluoxetine had completely different outcomes. One suggested that CBT helped when taken with fluoxetine, and the other study did not include CBT at all. Prescription drugs work best in combination with psychotherapy (Crow, 2014). Further research should be performed on fluoxetine alone before recommending this drug to BED patients. With a significant reduction in binge-eating episodes in one of the studies, however, this drug has potential.

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Lisdexamfetamine (Vyvanse). Lisdexamfetamine is traditionally used to control symptoms of attention deficit hyperactivity disorder (ADHD). Since lisdexamfetamine helps control difficulty with focusing, remaining still, and controlling specific actions, the literature has demonstrated that it has helped some BED patients control their binge-eating episodes. This happens due to lisdexamfetamine being in a class of medications called central nervous system (CNS) stimulants, which modulate the levels of specific natural substances in the brain, such as serotonin and norepinephrine (Fornaro et al., 2016). Lisdexamfetamine is a medication of the d-isomer of amphetamine, a non-catecholamine of the CNS. When ingested, lisdexamfetamine is converted to dextroamphetamine, which facilitates the release of catecholamines (dopamine and noradrenaline) from its storage sites in the CNS, then inhibits their uptake in the brain, resulting in changes in behavior, such as mental alertness, euphoria, and appetite suppression (National Institute of Health {NIH}, 2020). Lisdexamfetamine is a controlled substance on the Drug Enforcement Administration Schedule II (DEA), which means that it can lead to abuse and severe dependence. Side effects of lisdexamfetamine are dizziness, weight loss, and dry mouth. Drug interactions with lisdexamfetamine are bupropion, Cymbalta, Effexor, Lexapro, Prozac, Wellbutrin, and Zoloft.

A comprehensive, systematic review was performed by Fornaro et al. (2016) on lisdexamfetamine. This review's eligibility criteria, participants, and interventions were focused on major functional and clinical outcomes of efficacy and tolerability of lisdexamfetamine in those with moderate-to-severe BED. The review consisted of randomized-controlled trials only, using Yale-Brown-Obsessive Compulsive Scale Modified for Binge Eating total score, weight, response, and remission rates (all, $P < 0.01$). However, the limitation of this review was the lack of information about relevant psychiatric or other medical comorbidities (Fornaro et al., 2016).

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It was concluded that lisdexafetamine (in doses of 30, 50, or 70mg/day) led to a significant reduction in binge eating compared to placebo. However, there were adverse effects and high discontinuation rates. Continued research on lisdexafetamine and BED is recommended.

Another study was performed by Heo & Duggan (2017) using lisdexamfetamine on BED patients. There were three groups in this study: a 12-week group (N=30), a 26-week group (N=32), and a 52-week group (N=30). Each group was split between lisdexamfetamine and a placebo. The doses of lisdexamfetamine given were 50–70/mg per day. Questionnaires were given to each participant to track progress (or lack thereof), and follow-ups were given at 12, 20, 26, 40, and 52 weeks. The 12-week lisdexamfetamine group showed some short-term progress in reduced binge-eating episodes, with some relapse after the 12 weeks (versus the placebo), and with few dropouts (7%). The 26-week lisdexamfetamine group showed both significant short and long-term progress in decreased binge-eating episodes, with some relapse after 26 weeks (versus the placebo) with few dropouts (9%). The 52-week lisdexamfetamine group showed both short and long-term progress in reduced binge-eating episodes versus the placebo, with the most sustainability long after the 52 weeks. However, the 52-week group had a higher dropout rate (16%). In the 26- and 52-week lisdexamfetamine groups, some weight loss occurred, but not in the 12-week group. All placebo groups did not show improvement in binge-eating episodes. However, all lisdexamfetamine groups reported similar symptoms of dry mouth, insomnia, and headaches. Lisdexamfetamine showed a longer-term reduction in binge-eating episodes for those who stayed in the study longer. One limitation of this study may be the side effects, but lisdexamfetamine is the only approved drug in the United States for treating BED directly.

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Sertraline (Zoloft). Sertraline is an oral medication (an SSRI) that helps balance brain chemicals in patients with depression, anxiety, panic disorder, or obsessive-compulsive symptoms. Sertraline is a naphthalenamine derivative with the pharmacological action of inhibiting the reuptake of serotonin from the synaptic cleft (DeVane et al., 2002). Sertraline is normally used in the management of panic disorders, OCD, and PTSD. It is a drug that is absorbed slowly after taking it orally. Sertraline is eliminated from the body by metabolic pathways to form a ketone and an alcohol, which are largely excreted renally as conjugates (Devane et al., 2002). It takes about 22-26 hours to be excreted. It was observed that multiple enzymes are involved in sertraline metabolism and it was suggested that no single agent can alter or impact the pharmacokinetics of sertraline.

Thirty-four outpatients participated in a placebo-controlled trial of sertraline in the treatment of BED (McElroy et al., 2000). This trial included a sertraline group (N=18) and a placebo group (N=16) for 6 weeks. The trial was double-blind, and the doses were flexible (50–200 mg daily). Comparing the two groups, sertraline was associated with a significantly greater rate of reduction in binge-eating episodes, clinical severity of the illness, and BMI. Exclusions to this study were pregnant and lactating women, those with other severe illnesses, and those with cancer. There were few drop-outs and no bias information was detected. One limitation of this study, however, was that it did not note the average dose of those who had positive outcomes. Proper dosing will help the future treatment of sertraline.

Another study performed on sertraline by Milano et al. (2005) consisted of 20 female subjects with an average age range of 24–26 years old. These 20 women had either BED or BN (binge and purge). The female participants were split into two groups, with 10 participants receiving sertraline and 10 participants receiving a placebo. The sertraline group received

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100mg per day for 12 weeks. The subjects received clinical assessments every week via questionnaires on their behavior, a diary of food choices, and side effects. At the end of the 12 weeks, the sertraline group showed a 75% reduction in bingeing episodes and purging episodes. The placebo group showed a 10% reduction in bingeing and purging episodes. Neither group, however, had a reduction in weight. Sertraline was very well tolerated. Follow-ups were weekly and there were no drop-outs. Since this study was small, but showed promise, sertraline and BED should be further researched.

A systematic review and meta-analysis of several antidepressants were performed by Stefano et al. (2007) on individuals with BED. The databases used were PubMed, Embase, PsycINFO, Lilacs, and Cochrane. The articles used were dated January 1994 to December 2005. From all 3,357 articles, the authors selected 19 to review and analyze. Seven articles fulfilled the criteria and were included in the final analysis (N=322), however, they were all considered to have unclear or doubtful results. Antidepressants were associated with a significant increase in remission rates (40% versus 22%). The study with the longest duration of 16 weeks reported an increase in remissions rates in the placebo group (95%). There were no significant differences between antidepressants and placebo for frequency bingeing episodes or weight change. However, antidepressants were associated with a significant reduction in HAM-D depression scores compared to the placebo (Stefano et al., 2007). The inclusion criteria for methods used to monitor depression in this analysis were the scores on the Hamilton Scale for Depression. The exclusion criteria for these seven articles were children, pregnant women, lactating women, cancer patients, and subjects taking other antidepressants. The drugs evaluated in this analysis were fluoxetine, sertraline, and citalopram. One strength of this meta-analysis and systematic

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review was that the authors chose studies in which in-person follow-ups were implemented, charts were closely monitored, and strict criteria were met.

Topiramate (Topamax). Topiramate is a sulfamate-substituted monosaccharide with an anticonvulsant property. Topiramate antagonizes the glutamate receptors, which helps stabilize the neurons of the CNS (NIH, 2020). Topiramate is not an antidepressant. It is normally used to prevent and control seizures and migraines and to help in the treatment of PTSD. Topiramate's mechanism of action may act via several mechanisms which include potentiation of γ -aminobutyric (GABA) inhibition, the modulation of sodium channels, excitatory neurotransmission, and voltage-dependent calcium ion channels (Mula et al., 2006). This is how topiramate prevents seizures and helps with headaches. Topiramate suppresses AMPA/kainite receptor and this might contribute to the decrease in appetite that some BED patients experience (Mula et al., 2006).

There are many side effects reported with topiramate, including anxiety, confusion, dizziness, drowsiness, diarrhea, dysphasia, fatigue, memory impairment, nausea, headaches, nervousness, lack of concentration, speech disturbances, visual disturbances, weight loss, and mood changes. Drug interactions are abilify, amitriptyline, benadryl, metformin, and Seroquel.

A randomized, double-blind, placebo-controlled trial by McElroy et al. (2003) was performed for 14 weeks on 61 BED patients, 30 of whom took topiramate and 31 of whom took the placebo. All patients were obese, and the group consisted of both men and women. The doses of topiramate were flexible (25–600 mg per day). Doses started at 25 mg per day and increased as the study continued. At the end of the study, the 43 participants provided outcome measures at a final dose of 250 mg/day. Binge frequency and weight decreased significantly from baseline to the end of the study for all 43 participants (-3.2 ; $p < .001$). Fifteen of the open-

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label participants in the controlled group showed a P-value of (-4.0; $p < .001$), and 15 of the double-blind participants who received topiramate showed a P-value of (-2.5; $p = .044$). There was a 30% dropout rate due to adverse effects. The measurements used in this study were the Clinical Global Impression Severity Scale and the Yale-Brown Obsessive-Compulsive Scale. The 250 mg dose had the strongest effect on weight loss and decreased hunger, with 94% of the topiramate group showing these positive results. Forty-two percent of the placebo group had a reduction in binge-eating episodes and weight loss, which could indicate that the treatment may not have been better than the placebo control group.

A strength of this study was that each group was monitored, and notes were taken regularly, which could be more reliable than take-home questionnaires (McElroy et al., 2003). There was a small drop-out rate in the topiramate group because of headaches possibly caused by the drug. There were higher drop-outs from the placebo group for various unknown reasons. In conclusion, topiramate showed some promise but still needs further research.

McElroy et al. (2004) performed an additional study on topiramate using the same varying dosages. The same number of obese participants were chosen ($N=61$) for a 14-week study. Thirty-five of the participants were chosen to remain in the study for an additional 42 weeks; 15 of those participants received topiramate, and 16 participants received a placebo. The same dosage of 250 mg showed again to work the best, resulting in decreased bingeing, decreased hunger, decreased BMI, and significant weight loss. There were some dropouts for non-related health issues (e.g., glaucoma and kidney stones) and adverse events. The exclusion criteria were pregnant and lactating mothers, cancer, and severe psychological disorders (e.g., bipolar disorder and schizophrenia).

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Neither study performed by McElroy et al. (2004) combined psychotherapy with the topiramate treatment, however, and the drug still showed effective outcomes.

Citalopram. Citalopram is an SSRI used to treat depression, as it helps restore the balance of serotonin in the brain. Oral administration is rapidly absorbed within 1–4 hours after taking it. Approximately 12–33% of citalopram is excreted unchanged in the urine, and approximately 10% is excreted in the feces (Sangkuhul et al., 2011). Citalopram and its N-demethylated metabolites depend primarily on S-citalopram and S-desmethylocitalopram, the active ingredients in escitalopram, discussed elsewhere in this chapter. Citalopram's molecular target is the serotonin transporter SLC6A4, which inhibits serotonin reuptake from the synaptic cleft (Sangkuhul et al., 2011). Citalopram is less potent than escitalopram. Side effects of citalopram are drowsiness, insomnia, and nausea. Drug interactions are bupropion, Flexeril, Nexium, phentermine, Seroquel, Tramadol, Trazodone, and Wellbutrin.

There are few reliable studies on citalopram and recovery from binge-eating disorder, but the drug showed some benefits so far. A randomized controlled study performed by McElroy et al. (2003) included 38 outpatients with BED. The citalopram group (N=19) and the placebo group (N=19) participated in a six-week, double-blinded study with varying dosages (20–60 mg per day). The participants receiving citalopram had a significantly greater rate of reduction in binge-eating episodes ($p = .003$), frequency of binge days ($p < .001$), BMI ($p < .001$), weight ($p < .001$), and severity of illness ($p = .028$). The mean dose in the citalopram group was 57.9 mg per day. The differences in the two groups were significant, which suggested that taking citalopram is beneficial. There were some dropouts and no bias was detected. There was no available information on whether the participants in this study received psychotherapy while taking citalopram.

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Adverse Childhood Experiences (ACEs)

Adverse childhood experiences (ACE) plays a role in an individual's immediate and future health. ACEs are identified as harmful experiences that occurred during childhood or adolescence (e.g., verbal abuse, emotional abuse, physical abuse, sexual abuse, or any other mistreatment). These adverse experiences affect a child's or adolescence' health, with additional health issues developing in their adult years. Such health issues include anxiety, depression, eating disorders, substance abuse, violent behaviors, mental issues, and inactivity (Hughes et al., 2017). In addition, inactivity can lead to obesity, heart disease, and diabetes. Hughes et al. (2017) performed a systematic review and meta-analysis, in which five databases were used to find multiple studies on ACEs. There were 253,719 participants in 23 studies found with specific criteria. The criteria focused on subjects at least 18 years old with no high-risk health conditions. One of the associations found in many of the participants was between eating disorders and obesity. The authors found that being in an abusive relationship can cause low self-esteem, body image issues, and a depressive mood. Also, abuse in one's childhood years can cause substance abuse, mental health issues, violence, and weight issues in one's teenage or adult years.

Alcohol and drug abuse can mask negative feelings in those with ACEs. A review performed by Schreiber et al. (2013) reported the use of different classes of drugs by those with BED and substance abuse. The authors included the following criteria on those with BED and substance use disorder: (a) the substances are used for a greater amount of time or a greater amount of quantity than intended; (b) the subject is unable to reduce the substance abuse despite their intent; (c) binge-eating episodes create more stress and the urge or craving to use more substances; (d) the substance use interferes with work, school, or home commitments; (e) social

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or recreational activities are withdrawn from due to substance use; and (f) the subject experiences withdrawal symptoms when trying to decrease the substance use. Though the authors were able to demonstrate that ACEs can lead to substance abuse and other compulsive behaviors like those found in those with BED, recovery from BED requires the management of food, whereas recovery for substance abuse requires complete abstinence from the actual substance. As we need food to survive, we cannot teach an individual to survive without it, but an individual can survive without drugs or alcohol. Further research is needed on the severity of BED and ACEs since many factors, behaviors, and psychological components are tied to the disease.

The devastating effects of child abuse (physical, sexual, mental, and emotional abuse) has been well documented. Exposure to traumatic experiences in childhood has been linked to substance abuse and disorders, such as Sudden Unexplained Death Syndrome (SUDS), Post-Traumatic Stress Syndrome (PTSD), eating disorders, and mood-related psychopathology (Khoury et al., 2010). One study performed by Khoury et al. (2010) examined the relationship between childhood trauma, substance abuse, and PTSD in 587 patients (228 males and 359 females). All patients were recruited from an OB/GYN clinic at a hospital in Atlanta, Georgia. Data from all patients were collected through in-person interviews and screenings, and follow-up sessions were performed. A high rate of dependence on various substances was reported (39% alcohol, 34.1% cocaine, 6.2% opiates, and 44.8% marijuana). Cocaine was strongly correlated with adverse childhood events (ACE), which included physical, emotional, and sexual abuse. PTSD was found in the cocaine group as well. Although their study did not focus on eating disorders directly, it did show that traumatic childhood experiences can cause substance abuse, which is a compulsive behavior, as is binge-eating.

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The exclusion criteria for this study were mental and psychotic disorders. Eligibility for this study included past abuse (mental, emotional, or physical), current substance abuse, legal issues, being single, married, or divorced, any race, any religion, and adulthood. All patients who met the eligibility requirements participated in a one-day screening, filled out a demographic form, and were given self-reporting assessments to take home. The authors suggested that awareness of childhood trauma is important in the critical understanding of how it leads to SUDS, PTSD, and eating disorders. Raising awareness can also increase the chance of implementing early intervention or treatment for those who are abused (Khoury et al., 2010).

Substance Abuse Counseling

Mentally, emotionally, and physically abused people with eating disorders often use substances to help them cope with their negative feelings. According to the Substance Abuse and Mental Health Administration (2010), 21.4% of BED patients use alcohol to mask their negative feelings, 19.4% use drugs, and 23.3% indicate the use of any substance. Finding a substance-abuse counselor and attending regular one-on-one or group sessions, are highly recommended for the treatment of and recovery from BED. Also, counseling helps individuals with BED find other activities and/or hobbies in place of their substances. Learning lifestyle changes and engaging in 12-step programs that help the subject deviate from substance abuse takes time. Counseling and taking the steps necessary for recovery will be discussed in later sections as part of the suggested recommendations for recovery.

Natural Agents

For individuals with BED who choose natural agents, several supplements and physical exercises can help boost self-esteem, decrease stress, decrease depression, decrease anxiety, and change negative behaviors and thoughts.

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Supplements That May Boost Serotonin Levels and/or Dopamine Levels

St. John's wort (*Hypericum perforatum*). St. John's wort is used to reduce mild to moderate, but not severe, depression. It performs a similar function to that of an SSRI (Linde et al., 2009). In the brain, St. John's wort helps boost serotonin levels, which are responsible for sleep, mood, appetite, memory, and learning. Researchers, Linde, et al. (2009), collected data from 29 trials (with a total of 5,489 patients) and concluded that St. John's wort was as effective as a prescription antidepressant, with few side effects. The recommended doses for St. John's wort are 600–900 mg per day (divided into 2–3 doses). The side effects of St. John's wort are minor, but patients are advised to consult with a doctor before taking it.

St. John's wort seems safe and effective and can be used in the treatment of BED for mild to moderate depression. It could also alter cytochrome enzyme function and therefore alter the clearance of many medications (Markowitz et al., 2003). An alteration can make a drug less active.

5-Hydroxytryptophan (5-HTP) and Tryptophan. 5-Hydroxytryptophan (5-HTP) and tryptophan are serotonin boosters that reduce depression and anxiety. Tryptophan is also an amino acid found in animal and plant foods. Tryptophan balances nitrogen in the body and creates niacin and 5-HTP, which are essential in creating serotonin. Since the body uses 5-HTP and tryptophan to produce serotonin, these natural agents may have the benefits of decreasing depression, anxiety, and negative thoughts and improving sleep. A meta-analysis was performed by Shaw et al. (2007) on the effectiveness of 5-HTP and tryptophan on depression. Of the 108 trials analyzed in the meta-analysis, only two met the inclusion criteria (with 64 participants total). The criteria included subjects with unipolar depression or dysthymia. The computerized search for these trials included Medline, Psychlit, Ebase, Cochrane Controlled Clinical Trials

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Register, and Cochran Collaboration Depression/Anxiety. Publications in all languages were sought. The trials were scored according to the risk of bias. The authors concluded that a large number of trials addressed the research questions for 5-HTP and tryptophan, but few were of sufficient quality to be reliable (Shaw et al., 2002). There is evidence that suggests these natural agents are better than the placebo at alleviating depression, but further studies should be performed to evaluate the efficacy of 5-HTP and tryptophan before recommending it for BED.

S-AdenosylMethionine (SAmE). SAmE is naturally found in the body, and it may be effective as an antidepressant (Galizia et al., 2016). SAmE has been highly marketed in a few European countries since the 1980s to treat depression and other medical conditions (e.g., fibromyalgia, osteoarthritis, migraines, and liver disease). In the United States, SAmE is classified as a dietary supplement and is not formally recognized as an indication for the management of any disease or disorder, including depression.

SAmE is an important methyl donor and a necessary step in the synthesis of neurotransmitters serotonin, norepinephrine, and dopamine (Lake, 2018). The synthesis of these three transmitters by SAmE requires folate and vitamin B12. Many depressed individuals are deficient in folate and B12, therefore, it is recommended to take these vitamins along with SAmE (Lake, 2018).

Galizia et al. (2016) searched many scientific databases for all randomized, placebo-controlled trials on SAmE and depression in adults. SAmE was compared not only to placebo but also to escitalopram, a prescription drug also reviewed in this dissertation. Eight studies involving a total of 934 people were reviewed. The criteria for these eight chosen studies were adults who were diagnosed with major depression. The databases used were Medline,

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PsycINFO, and Embase. The authors also performed an extraction of data and an assessment of the risk of bias.

This review by Galizia et al. (2016) found no strong differences in effectiveness between SAME and escitalopram when used separately, compared to the placebo. However, when SAME and escitalopram were used together, they were superior to the placebo. These results showed that, when used in combination with escitalopram, SAME can help with depression by increasing dopamine levels in the brain. SAME, together with escitalopram, showed a decrease in depressive symptoms from baseline to end of treatment (95% CI -2.75 to 2.99, $P = 0.93$; 129 participants) 3 of the 8 studies (Galizia et al., 2016). This study did have some limitations because not all relevant data could be obtained. The authors tried to contact a few authors of the included studies for additional information and did not receive a response (Galizia, et al., 2016).

A review performed by Orsolini et al. (2015) reported that most of the studies on SAME and depression have predominantly small sample sizes (9-20 participants). That being said, the existing evidence does suggest some antidepressant characteristics of SAME when combined with an SSRI (Orsolini et al., 2015). The authors suggested that more and large randomized controlled clinical trials on SAME and depression should be performed, with high-quality methods. In the small studies reviewed by Orsolini et al. (2015), the authors did find that 20% of the participants experienced stomach discomfort when using SAME together with an antidepressant. Further research should investigate the risks and interactions between SAME and various antidepressants. SAME is considered safe but should not be taken by pregnant women, children, or lactating women (Galizia et al., 2016).

Even though the natural remedies discussed in this literature could be helpful to some individuals, patients are advised to seek a doctor's advice before taking any of them.

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Yoga Therapy

Yoga consists of functional exercises that help increase blood and oxygen circulation in the body, strengthen muscles, increase flexibility and range of muscular motion, and help relieve stress. For individuals with BED, yoga may help decrease stress, improve feelings about one's body image, and improve feelings of low self-esteem (McIver et al., 2009). A yoga study performed by McIver et al. (2009) included individuals with BED who had regular weekly sessions of yoga. The study concluded that yoga does help in the treatment of BED concerning decreased binge-eating and stress. A group of 45 women participated in this study for 12 weeks: 25 of them participated in yoga, and 20 were wait-listed (did not participate in yoga). These women were 25–63 years old, all diagnosed with BED, and not overweight. Each participant's BMI was under 25. The yoga group had reductions in binge-eating and stress, and their physical activity increased significantly. Their hip and waist measurements decreased as well. The wait-listed group did not improve their binge-eating habits, stress, or weight. One weakness of this study was that most of the information was self-reported (except for the hip and waist measurements), making them subject to inaccuracy. Since hip and waist measurements were not self-reported, however, the outcome for yoga is positive in that respect.

Acupuncture Therapy

Acupuncture therapy, used together with regular psychological treatments for binge-eating disorder, can be effective in minimizing depression and give a person a sense of control (Wu, 2016). Though there is no scientific evidence to strongly show the effectiveness of acupuncture for BED, acupuncture is widely used in Chinese medicine to help with BED and other eating disorders because it speeds up the recovery of the affected body systems that cause

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stress through the release of endorphins (Wu, 2016). When acupuncture is performed, certain points on the body become effective at helping with restoring balance, digestion, absorption, and metabolism, thus increasing energy in the body. The restored balance and new sense of control can aid patients in regaining their emotional and physical health, which may help individuals with BED control appetite and cravings better.

An article on acupuncture and depression studies, written by Wang et al. (2008), stated that “acupuncture triggers a sequence of events that include the release of endogenous opioid-like substances, neurotransmitters, and activation of the central nervous system”. These actions may help decrease depression and anxiety. A randomized crossover study performed by Fogarty et al. (2010) on acupuncture and eating disorders included nine subjects (five with anorexia nervosa and four with bulimia nervosa). The participants were all women, and their average age was 23 years old. Each participant received regular acupuncture treatments. The measuring tools used were the Eating Disorder Inventory, Becks Depression Inventory, State-Trait Anxiety Inventory, and Eating Disorder Quality of Life Scale. The results showed that acupuncture improved participants’ quality of life, as measured by the cognitive, physical, and psychological components of the Eating Disorder Quality of Life Scale (Fogarty et al., 2010). Other results showed a decrease in anxiety and perfectionism. All of the participants remained in the study and showed up for treatments. Fogarty et al. (2010) concluded that acupuncture shows potential as an adjunct therapy in the treatment of eating disorders.

Meditation

Meditation is another lifestyle intervention that can help reduce stress and anxiety. Meditation is a practice in which an individual uses his or her mind to focus on a particular thought, object, or activity. This type of practice helps train the brain to achieve a clear, calm,

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and stable state (Kristeller & Hallett, 2007). Regular meditation can help enhance the blood and oxygen supply to the brain and body and can result in the improvement of nervous system function and mood and a reduction in poor habits and negative thoughts (Kristeller & Hallett, 2007).

A 6-week meditation-based group intervention performed by Kristeller & Hallett (2000) for BED included 18 obese women. The intervention used standard and eating-specific mindfulness meditation exercises at 1, 3, and 6 weeks. Weekly assessments were taken on each patient's mental state, mood, and binge-eating habits. After the 6 weeks, binges had decreased in frequency (from 4.02/week to 1.57/week; $p < .001$) and severity (Kristeller & Hallett, 2000). Other tools used for scoring were the Binge Eating Scale and the Beck Depression and Anxiety Inventory; those scores also decreased in frequency. Patients stated that their sense of control increased because they were able to control their actions by controlling their minds. This trial suggested that meditation training may be an effective component in the treatment of BED. The researchers, however, did not indicate what other therapies the participants were receiving during this 6-week intervention. This could lead to invalid results.

Kristeller & Hallett (2007) performed an exploratory study in 2007 on meditation-based intervention for individuals with BED. This 6-month trial included 160 obese women over the age of 18 who met the criteria for BED, which were defined here as recurrent episodes of bingeing, feelings of loss of control, and dysregulation of physiological, behavioral, and emotional systems. The measuring scales used were the Binge Eating Scale (BES) and the Beck Depression and Anxiety Inventories. The additional assessment used in this trial was the Tellegen Absorption Scale. The data taken from each participant included their weight, blood pressure, blood glucose levels, lipid profile, and responses to a questionnaire on self-esteem and

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their current diet. This additional data was not gathered in the authors' first trial and could help produce more accurate outcomes. Participants were evaluated at 1, 3, and 6 weeks; then once a month until 6 months. Binges decreased in frequency from 4.02/week to 1.57/week ($p < .001$), and in severity (Kristeller & Hallett, 2007). Scores on both scales decreased, especially on the BES scale ($r = .66$, $p < .01$). There were many dropouts by the end of the 6-month trial.

However, those who stayed in the study experienced positive results of decreased binges and decreased depression. Further research is needed with reliable long-term participants to support the evidence found in both of these trials and to support the further investigation of a meditation-based intervention as part of the treatment for BED.

Hormone Possibilities

Pramlintide. Imbalances in hormones could play a role in binge-eating disorder. There are a couple of hormone treatments that appear promising for helping patients obtain a feeling of satiety. One is pramlintide, a man-made hormone that resembles the human hormone amylin, which is produced by the pancreas and released into the bloodstream after each meal. Amylin helps the body regulate blood glucose levels and energy balance by suppressing gastric emptying. Amylin aids in digestive processes to control the rate of digestion by releasing gastric acid, pancreatic enzymes, and bile. Amylin is released at the same time as insulin but in different quantities. The brain controls the stabilization of the release of amylin into the bloodstream to prevent spikes or drops in blood sugar. When this happens, amylin acts as a signal in the body for reducing food intake. The beneficial effects of pramlintide have led to its FDA approval in the treatment of diabetes mellitus (Mietlicki-Baase, 2016). The ability of amylin to promote energy balance and the suppression of appetite, have made amylin a leading

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target for producing pharmaceutical therapies in the treatment of obesity and BED (Mietlicki-Baase, 2016).

Since Pramlintide is being used to treat diabetes patients to help control their blood glucose levels, it is now being tested on patients with BED due to imbalanced blood glucose levels being associated with feelings of hunger (American Psychological Society {APS}, 2010). APS (2010) reported on a study with 88 participants treated with pramlintide (N=44) or placebo (N=44) for 6 weeks. The participants received either pramlintide or a placebo via subcutaneous injections 15 minutes before each major meal (breakfast, lunch, and dinner). Both groups self-reported their progress on days 17 & 31 and then returned to the clinic on day 44. The pramlintide group was given high-fat and high-sugar foods on days 2, 4, and 44, then rated their feelings of fullness. On the days where the pramlintide group did not receive high-fat and high-sugar foods, their calories were decreased. The placebo group was not given high-fat and high-sugar foods on any day. At the end of this study, 83% of the pramlintide group reported a decrease in cravings and hunger compared to 58% of the placebo group. The pramlintide group also experienced mild, if any, binge-eating episodes, and the placebo group experienced mild to moderate binge-eating episodes. The authors explained that pramlintide affected certain “hedonic” aspects of eating: e.g., they felt a sense of reward when consuming high-fat and high-sugar foods (APS, 2010). Because the participants self-reported their feelings and binge-eating episodes, this could serve as a bias for the study which, in turn, may have affected the accuracy of the overall results. So far, pramlintide looks promising as a treatment for BED and is considered safe. Further research is suggested to support pramlintide as a treatment for BED.

Ghrelin and Leptin. The hormone ghrelin may be partially responsible for all eating disorders (anorexia, bulimia, and binge-eating disorder). Researchers believe that the underlying

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pathology of eating disorders is associated with changes in hormones that are involved in energy balance and food intake (Atalayer et al., 2012). Ghrelin is one of the key hormones involved in appetite, along with several neuropeptides. Ghrelin is a gut hormone-containing 28 amino-acid peptides and those levels increase during fasting and decrease following a meal. Though levels of ghrelin might differ in each individual with an eating disorder depending on his or her age, BMI, and duration of illness, researchers believe that balancing ghrelin levels can help treat eating disorders (Atalayer et al., 2012).

Leptin is a hormone found mostly in fat cells that is known to regulate adipose tissue mass and energy balance, and suppress hunger. Leptin communicates with the hypothalamus in the brain and is believed to be responsible for obesity, body temperature, reproductive and development, regulation of hormones (including insulin), and the regulation of mood (Paz-Filho et al., 2014). Circulating leptin levels are in proportion to body fat mass, and it fluctuates in accordance to change in nutrition status (Zhou & Rui, 2013). Circulating leptin levels are higher in obese individuals (Zhou & Rui, 2013). Plasma leptin levels decrease when fasting.

Leptin levels may be associated with depression. A study performed by Lu (2007) reported that plasma leptin levels were higher in depressed patients, especially in females. In contrast, other reports found that low leptin levels were associated with depression (Lu, 2007). Lu (2007) analyzed many other reports on leptin and depression, and found that leptin levels were decreased in patients who had major depression, suicidal attempts, and bipolar disorder. A possible reason for such contradicting data may be because leptin levels are influenced by many factors including body mass index, sex, age, sample size of a study, and other disorders (Lu, 2007).

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There is a hormone replacement therapy for leptin called metreleptin, which is the only current pharmaceutical form of leptin (Paz-Filho et al., 2014). Metreleptin is used to treat subjects with eating disorders, diabetes, lipodystrophy, and chronic liver disease via subcutaneous injection. So far, metreleptin has shown improvements in normalizing specific endocrine axes, decreasing insulin resistance, and improving lipid profiles in obese subjects (Paz-Filho et al., 2014). It has also shown remarkable weight loss in subjects with chronic liver disease (Paz-Filho et al., 2014).

Metreleptin is also used to treat those with congenital leptin deficiency (CLC), a rare autosomal recessive condition caused by a mutation in the leptin gene. Individuals with CLC have insulin resistance, morbid obesity, and immune dysfunction. A study by Neff (2019) on the use of metreleptin in the treatment of obesity and CLC is expected to be completed in 2021. So far, three dozen patients worldwide with leptin gene mutation have been treated safely and successfully with metreleptin for the past two decades (Neff, 2019). These patients have shown improvement in weight loss, hormone balance, energy balance, and decreased hunger. This is a positive outcome so far, and the final results could determine whether metreleptin can likely be used in the treatment of BED.

Research continues to show that leptin affects food intake, feelings of reward, motivation, brain cognition, and body fat (Morrison, 2009). Morrison (2009) suggested that individuals can achieve control of one's own leptin levels by making certain lifestyle changes. For example, some individuals with eating disorders have low body fat, which will cause their leptin levels to decrease, and hunger may decrease. Overweight individuals may have higher levels of leptin (Morrison, 2009). Many obese individuals have a resistance to leptin (Morrison, 2009). Leptin

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levels can be balanced by not skipping meals or going long intervals without eating. It is suggested to eat smaller and more frequent meals (Morrison, 2009).

To help balance leptin levels in the body, it is recommended that patients eat more whole foods (filling foods) that will not increase their hunger (Rexford, 2008). Sugar and processed foods tend to increase insulin levels, thus triggering leptin levels (Rexford, 2008). The more sugar and processed foods the body consumes, the more it craves, so avoiding sugar and processed foods can help regulate leptin levels in the body and thus reduce binge-eating episodes. Teaching individuals with BED how to achieve this balance, eat better, control food portions, avoid processed foods, incorporate an eating schedule, and read food labels can be very beneficial but challenging. Working with a registered dietician or clinical nutritionist can be instrumental in developing a personalized meal plan for each individual with BED.

Genetic Influences

N-Methyl-D-Aspartic Acid (NMDA). Many researchers are studying the genetic factors of BED. There are some treatments so far. One genetic receptor, N-methyl-D-aspartic acid (NMDA), has been linked to addiction-related behaviors in individuals with BED (Smith et al., 2015). NMDA is not fully understood yet, but one study by Smith et al. (2015) aimed to characterize the effects of the NMDA receptor antagonist, called memantine, on food-induced behavioral adaptations in rats. The model used on rats mimics the characteristics observed in human individuals with BED.

The rats were divided into two groups, one of which received a sugary diet (the palatable group) and one that received a regular chow diet (the chow control group). Both groups were given memantine and fed once a day. The effect of memantine on food-seeking behavior was tested between feedings. In the palatable food group, memantine decreased binge-like eating and

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blocked food-seeking behavior (i.e., compulsive behavior). Memantine did not affect performance in the chow food group. Since there is no other treatment to test NMDA receptors, more studies on memantine should be performed to compare outcomes, and it should be tested on humans as well.

A study performed on mice by Krashia et al. (2016) has shown amino acid D-aspartate to be an endogenous NMDA receptor agonist. In their study, an increase in brain D-aspartate levels improved cognition in the mice. In addition, both D- and L-aspartate stimulated dopamine neurons by activating NMDA and metabolic glutamate receptors. These findings may be promising for using NMDA for cognitive behavior in those with BED because the activation NMDA is from D- and L-aspartate exciting dopamine neurons. This activation can improve cognition in the brain and/or prevent neuronal degeneration (Krashia et al., 2016). Dopamine was previously discussed in this dissertation as a hunger trigger. A decrease in dopamine levels can cause an increase in hunger in those with BED (NEDA, 2018). Dopamine is also triggered by a major change in life (i.e., social and emotional changes). Further research is suggested for NMDA and BED since there is no proven direct link between them.

C57BL/6 & Cytoplasmic FMR1-Interacting Protein 2 (CYFIP2). Two genes have been identified as having a heritable effect on BED (Kirkpatrick et al., 2016). These genes are C57BL/6 and FMRI-interacting protein (CYFIP2). A mutation in C57BL/6 in mice showed a rapid and robust escalation in palatable food consumption (Kirkpatrick et al., 2016). A mutation in CYFIP2 was also found in these mice and may be the major genetic factor underlying binge-eating. CYFIP2 is a p-53 inducible protein and has been shown to interact with FMR1. The pre-mRNA of protein CYFIP2 is dependent on RNA editing, as the editing site is a single nucleotide polymorphism rs3207362 (Kirkpatrick et al., 2016).

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The study performed by Kirkpatrick et al. (2016) assessed mice using gene targeting to validate genetic factors. They also used transcriptome analysis of the mRNA sequencing to identify the premorbid transcriptome and binge-induced transcriptome to target binge eating susceptibility and establishment (Kirkpatrick et al., 2016). It was the transcriptome analysis of premorbid genetic risk factor that identified morphine addiction and retrograde endocannabinoid signaling when tested on mice for substance addiction. For binge eating, it was identified that the downregulation of a gene set decreased myelination and expression. The researchers, Kirkpatrick et al. (2016), believe that they can therapeutically promote remyelination in the recovery from binge-eating behaviors. The outcome on the mice provides a promising start to the research on gene mutation and BED, however, further research is needed to produce conclusive results.

Environmental Influences

It is becoming increasingly clear that eating disorders (including BED) are prevalent among the relatives of those with similar disorders (Mazzeo & Bulik, 2009). Furthermore, numerous twin studies found that eating disorders are influenced by genetic factors (Mazzeo & Bulik, 2009). Being around someone who repeatedly looks in the mirror and obsesses about weight can affect those around them. For example, low self-esteem, fear of becoming fat, and food deprivation followed by binging on food could cause another family member to question his or her own body and lower his or her self-esteem (Scheel, 2018).

Another example of environmental influences is the effect of being surrounded by groups of people who share self-image or weight-pressure issues. For instance, membership in a dance or gymnastic group whose members feel pressured to stay thin can be overwhelming to someone with BED (or potential BED). Jobs, where body image is important, can also affect those with

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BED (or potential BED). Jobs including working in gyms, modeling, acting, and airline stewardesses had to meet weight restrictions to work in their profession. As this prejudice on weight has been outlawed, it still may exist, but employers must have a valid reason. An example of this is that airline stewardesses must not exceed a certain weight so they can fit easily through the narrow isles of the aircraft and for other safety reasons (Forest, 2020).

Athletics is a way for individuals to build self-esteem through physical improvements and conditioning, but not all outcomes are positive. The pressure to win and meet body weight for some sports can be overwhelming. The pressure of competitions such as gymnastics, boxing, bodybuilding, swimming, ice-skating, and running require speed through lower body weight (NEDA Feeding Hope, 2018). This can create an eating disorder, mostly for women than men (NEDA Feeding Hope, 2018). Sometimes the coaches place pressure on the athletes to lose weight. Three risk factors to eating disorders amongst athletes are social influences that emphasize thinness, negative self-appraisal of achievement, and performance anxiety (NEDA, 2018).

Being in an abusive relationship can also be a complicating factor for BED and may cause someone to rethink their self-worth and lose self-esteem. Being told that one is not good enough at work or home can affect self-esteem. It often takes only one negative comment for an individual with BED to become depressed or have feelings of low self-esteem (Scheel, 2018). A study performed by Mazzeo & Bulik (2009) found that mothers who were overly concerned about their daughter's weight or physical appearance could trigger BED behaviors. Dr. Judy Scheel, a licensed psychiatrist, stated that "children of mothers with an existing or past eating disorder reported higher levels of eating disorder symptoms than other children, and have more concern about their children's weight than other mothers" (Scheel, 2018).

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One cohort study by Allen et al. (2014) assessed 221 mother-child dyads (both mother-daughter and mother-son dyads) in Australia to see whether maternal family factors predicted eating disorder symptoms in their children. At baseline, measurements of BMI, weight, and general psychological stress were taken from all children. The average age of the children was 10 years old. Regular follow-ups were performed for the first year, followed by another follow-up at 2 years. Linear mixed models were used to analyze levels of dietary restraint, emotional eating, binge-eating, and any eating disorder psychopathy.

The results showed that the children of mothers with a current or past eating disorder reported significantly higher levels of eating disorder symptoms (including emotional eating) than did other children. Maternal concerns about child weight and family exposure to stress became predictors of their children's eating-disorder symptoms (Allen et al., 2014). This study showed a relationship between mother-child dyads concerning eating behaviors and emotional stress. Only 32% of the participants remained in the study, however. Despite this low number of remaining participants, the results showed some relationship between children of parents with eating disorders, but further research is much needed.

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Chapter 3

Methods and Procedures

Methods

The main search methods used were internet-based search engines, libraries, and databases to analyze and examine publications to research binge-eating disorder (BED) causes, treatments, and genetic factors. The research used was dated between 2000 and 2020, and the criteria used had exclusion and inclusion data.

Procedures

Search procedures. A careful and thorough review of the literature related to BED and its treatments was conducted. The review highlighted the following topics: (a) binge-eating disorder, (b) signs and symptoms, (c) affected populations, (d) genetic factors, (e) environmental factors, (f) adverse childhood experiences, (g) treatment medications, (h) psychological treatments, (i) natural agents, (j) diet and nutrition, (k) substance-abuse counseling, (l) endocrinology, (o) hormones, and (p) other lifestyle changes.

Libraries used. There were three libraries used for this literature review: the Wiley Online Library, the Public Library of Science, and CORE.

Search engines and databases used. The following databases were used to search the sources of this literature review: PubMed, Springer, Google Scholar, Science Direct, Science Daily, and the Cochrane Database of Systematic Review. Other sources used were *The Journal of Eating Disorders*, *Journal of Clinical Psychiatry*, *American Journal of Psychiatry*, *World Psychiatry*, *Biological Psychiatry*, *Psychology Today*, and the Centers for Disease Control.

Search terms. Several search terms were used to identify sources for this literature review: (a) binge-eating disorder, (b) causes of binge-eating disorder, (c) signs and symptoms of

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binge-eating disorder, (d) medications for binge-eating disorder, (e) psychological treatment for binge-eating disorder, (f) genetic factors for binge-eating disorder, (g) physical activity, (h) diet and nutrition, (i) natural treatments, (j) environmental factors, (k) adverse childhood experiences, (l) family history, (m) hereditary factors, (n) substance abuse, (o) hormones, and (p) affected populations.

Boolean strings. Three Boolean strings were used: binge-eating disorder AND diet AND nutrition AND physical activity AND substance abuse.

Age of the sources. Sources from the last 20 years were used and considered for inclusion in this literature review, mainly for comparative purposes. Comparisons were made of psychotherapies, medications, and a combination of psychotherapy with medications over this 20-year period.

Inclusion criteria. There were four inclusion criteria: (a) literature published since 2000, (b) English-language, (c) peer-reviewed articles, journals, and studies, and (d) websites related to binge-eating disorder. The authenticity of the resources used from the internet was critically evaluated on (a) authorship, (b) publishing body, (c) date of publication, (d) objective reasoning, (e) verifiability and accuracy of the information, and (f) any bias information.

Exclusion criteria. There were three exclusion criteria: (a) literature published before 2000, (b) information not published in English, and (c) articles not peer-reviewed.

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Chapter 4

Results

This literature review provided substantial information that, while BED is a complex eating disorder, there is enough research to treat each BED patient with a variety of therapies tailored to their specific symptoms and needs. Some commonalities of BED are: (a) adverse childhood experiences, (b) depression, (c) low self-esteem, (d) concern with body image, and (e) frequent dieting. Also, other symptoms and traits of BED can vary by patient. These include: (a) genetic factors, (b) environmental factors, and (c) hormone imbalances.

BED is not a disease but a disorder. BED can be managed with the proper psychotherapy, medication, nutrition, and other lifestyle changes that are personalized for each individual, as the evidence in this literature review supports personalized therapies. The three main cornerstones in the treatment of BED are psychotherapy, medication, and nutrition, all of which are vital to the treatment of BED.

The four main psychotherapies used in the treatment of BED are cognitive behavioral therapy (CBT), interpersonal therapy, dialectical behavior therapy (DBT), and behavioral weight loss therapy (BWL). The research showed that CBT and IPT are the most commonly used psychotherapies to treat BED, and the most effective. CBT is the most studied and well-established psychological treatment for BED (Wilson et al., 2010). The research has shown that both individual and group sessions of CBT are associated with greater abstinence rates compared to other psychological treatments or no treatment at all.

The following section breaks down the expectations of each therapy and how it can be personalized to each individual's needs.

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Cognitive Behavioral Therapy

CBT focuses on the interaction among behaviors, thoughts, and feelings. The key components are mindfulness, cognitive structuring, self-monitoring, and establishing regular patterns of eating (Wilson et al., 2010). CBT also targets thoughts about shape, weight, coping, and feared foods (Tartakovsky, 2019). Strategies to prevent relapse are taught as well. CBT is a time-limited approach; therefore, good habits must be formed during this timeframe so that patients can self-administer long-term practice. Self-administration can sometimes lead to reverting to old habits. The recommended treatment is 12–20 sessions (Tartakovsky, 2019).

Interpersonal Therapy

IPT is a time-limited approach to treat mood disorders. Its main goal is to improve relationships and social functioning and help reduce stress. IPT provides strategies to solve problems, manage unresolved grief, and manage difficult life transitions: e.g., divorce or the loss of a job (Wilson et al., 2010). Since IPT is a time-limited approach, long-term efficacy can be hard for some individuals when practicing new habits on their own. The recommended treatment is 12–20 sessions (Tartakovsky, 2019).

Dialectical Behavior Therapy

Originally developed to treat borderline personality disorder, DBT is very helpful in treating depression, binge-eating habits, substance abuse, and PTSD (Wilson et al., 2010). Its goal is to help individuals regulate their emotions, communicate and interact effectively, tolerate distress, and be mindful about the present (Tartakovsky, 2019). The recommended treatment is 12–20 sessions (Tartakovsky, 2019).

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Behavioral Weight Loss Therapy

BWL programs are usually geared toward overweight and obese individuals. They focus on better eating habits, meal planning, meal timing, daily calorie intake, physical activity, and setting goals for continued weight loss (Butryn et al. (2011). BWL patients are expected to meet weekly for updates on their weight, BMI, and measurements. This type of program is usually run by a doctor or registered dietician. One issue with BWL is that it is expensive, and not all medical insurance covers this type of therapy. The number of sessions needed for the treatment depends on how much weight the patient has to lose.

Within the last two decades, new medications to treat BED have been approved. The evidence identified several prescription antidepressants that are effective in reducing anxiety and depression. The evidence also suggested that combining psychotherapy and antidepressants may lead to the best treatment results (Crow, 2014). Not everyone responds the same to antidepressants (e.g., the types, doses, and frequencies are all tailored to each individual). Also, weight loss is a commonly desired outcome of treatment when taking antidepressants, but very limited weight loss is observed with antidepressants alone (Crow, 2014). In some cases, antidepressants cause weight gain. One medication discussed in this review that is not classified as an antidepressant is Topiramate, a prescription medication used to treat seizures and migraines that has been shown to reduce appetite (Crow, 2014). Therefore, Topiramate is now used in the treatment of BED in some individuals. Table 1 summarizes the medications reviewed in this literature, showing the benefits and results of each from the given research.

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Table 1

Drugs Used in the Treatment of Binge-Eating Disorder

Name of drug	Recommended doses	Expected outcomes	Side effects	Literature results
Acamprosate	666 mg/day	Decreased binge-eating episodes	Abdominal pain, confusion, dry mouth, headache, increased urination, diarrhea	Needs further research since the evidence varies concerning binge-eating episodes.
Fluoxetine	60–300 mg/day	Reduction in depression, reduce binge-eating, and weight loss	Dry mouth, nausea, headache, dizziness, drowsiness	Studies are varied in reducing depression but are positive for reduced binge-eating and some weight loss.
Escitalopram	26.5 mg/day	Reduction in anxiety and depression	None reported	The results of all studies were positive except for one that varied concerning depression.
Lisdexamfetamine	30–70 mg/day	Control of focusing, remaining still, and compulsive actions	Dizziness, weight loss, dry mouth	Positive results for weight loss and binge-eating (compulsive behaviors)
Topiramate	250 mg/day	Stabilization of the CNS	Headaches, nausea, nervousness, mood changes, speech, and visual disturbances	The results were positive, but further research should be performed on those with depression since Topiramate is not prescribed for depression.

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Name of drug	Recommended doses	Expected outcomes	Side effects	Literature results
Sertraline	50–200 mg/day	Decrease in depression, anxiety, panic, and obsessive symptoms	None reported	Positive results for decreased depression, anxiety, and obsessive behaviors.
Citalopram	60 mg/day	Decrease in depression	Drowsiness, insomnia, nausea	Substantially positive results, but only two studies were compared.

New genetic factors for BED have been found over the past decade, and scientists are now working on developing enzyme-like medications for gene mutations. The studies analyzed here include only tests on mice, but this method has allowed scientists to identify the links between genetic mutations and behavioral variations. One link between BED and gene mutation is cytoplasmic FMRI-interacting protein, or CYFIP2 (Kirkpatrick et al., 2016). When CYFIP2 is mutated, nerve impulses to the brain are interrupted. Researchers believe that the characteristics of behaviors associated with BED could be connected to a decrease in the transcription of the genes used in myelination (Berrentini, 2004), a process needed for the normal flow of nerve impulses (in all nerve fibers) in the body. Scientists are working on the restoration of myelin in hopes of normalizing eating behaviors in those with BED.

A genetic receptor called glutamatergic N-methyl-D-aspartate (NMDA) is not fully understood but has been identified as an antagonist on palatable food-induced behaviors in rats (Smith et al., 2014). A new treatment called memantine, which mimics NMDA, showed decreased binge-like eating and fully blocked food-seeking behavior and compulsive eating in rats (Smith et al., 2014). The study performed by Smith et al. (2014) was the only peer-reviewed study on NMDA and BED. The results showed a reduction in food-seeking behavior (i.e.,

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compulsive behavior) in rats in the palatable food group. This study also provided evidence of the neuroanatomical site of action for the effects of memantine (Smith et al., 2014). Further testing should be performed on memantine since it is new and there are no other peer-reviewed studies to use for a comparison of the results of this treatment.

A study performed on mice by Krashia et al. (2016) showed the amino acid D-aspartate to be an endogenous NMDA receptor agonist. In their study, an increase in brain D-aspartate levels improved cognition in the mice. In addition, both D- and L-aspartate stimulated dopamine neurons by activating NMDA and metabolic glutamate receptors. These findings may be promising for using NMDA for cognitive behavior in those with BED because the activation NMDA is from D- and L-aspartate exciting dopamine neurons. This activation can improve cognition in the brain and/or prevent neuronal degeneration (Krashia et al., 2016). However, further research is suggested since there is no proven direct link between NMDA and BED.

Studies on twins have found that eating disorders are influenced by both genetic factors and environmental influences (Mazzeo & Bulik, 2009). These researchers have suggested that eating disorders run in families and genes that can be shared between twins. Even though the actual gene relating to eating disorders in twins has not been identified yet, the environmental influences are present. Since many twins tend to share similar qualities, thoughts, habits, dispositions, and behaviors, both would likely develop BED if one did. Also, the evidence shows that obesity, the environment, and parental influences can have a major influence on the behaviors of twins, or singletons, concerning BED. It is not possible, however, to determine from the results what risk factors are potent for which individuals with a specific genetic vulnerability to eating disorders (Mazzeo & Bulik, 2009). Further research should be performed on twins and BED, as this is potentially an environmental issue as well as a genetic connection.

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Hormone imbalances can contribute to BED, and researchers are working on hormonal treatment options for individuals with BED (American Psychological Society{APS}, 2007). Satiety hormones control food intake by signaling to the brain that one is satiated (APS, 2007). One satiety hormone, amylin, is secreted when eating and works together with insulin to help regulate blood sugar and help a person feel full. The research suggested that a synthetic form of amylin, called pramlintide, can help individuals with BED decrease their cravings or reduce their binge-eating behaviors. The research on pramlintide (APS, 2007) showed this treatment to reduce caloric intake and meal sizes in obese subjects. More research on pramlintide should be performed to compare results.

There is some relevance that eating disorders, including BED, are associated with certain hormones (i.e., leptin and ghrelin). Leptin is a protein hormone produced by fat cells in the regulation of fat storage and regulation, and ghrelin is a hormone produced predominantly in the stomach that is responsible for increased appetite. Atalayer et al. (2012) reviewed several studies that explained the relationship between leptin, ghrelin, and appetite. Leptin decreases appetite, stimulates metabolic rate, and increases energy. Ghrelin (leptin's counterpart hormone) increases appetite. In obese subjects and those with BED, the hormone leptin is increased, and levels of hormone ghrelin is decreased. When ghrelin levels in the body increase (usually before a meal when we are hungry), hunger increases. It has been established that many obese patients are leptin-resistant, but it has not been established that those with BED are leptin resistant (Atalayer, 2012). However, possible abnormalities in leptin may contribute to BED. Metreleptin is a treatment reviewed in this dissertation, which is the only current pharmaceutical form of leptin. Metreleptin is also used to treat diabetes (those with insulin issues), lipodystrophy, and chronic liver disease. A study performed by Neff (2009) on the use of

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metreleptin in the treatment of obesity and leptin resistance is expected to be completed in 2021. So far, three dozen patients worldwide with leptin gene mutation have been treated safely and successfully with metreleptin for the past two decades (Neff, 2019). These patients have shown improvement in weight loss, hormone balance, energy balance, and decreased hunger. This is a positive outcome so far, and the final results could determine whether metreleptin can likely be used in the treatment of BED.

Ghrelin participates in regulating energy as well. It adjusts hunger signals and energy output by utilizing fat storage and glycogen storage. The net effects of these processes reflect body weight. As discussed in one study by Muller et al. (2010), gastric brain communication is an essential part of energy homeostasis, where the brain tells the body it is hungry or not hungry. Both ghrelin and the dopaminergic reward systems are activated when the body is hungry. As dopamine triggers the body's circuit that communicates the hedonic and reinforcing aspects of food reward, ghrelin acts on the actual feeding behaviors (Egerton et al., 2016). Ghrelin does not increase the size of a meal, but increases the number of meals consumed.

The study by Atalayer et al. (2012) reported that ghrelin's precursor (called des-acyl) was administered intravenously and it showed a tendency to decrease food intake. This could be the start of treatment for an imbalanced ghrelin hormone. Atalayer et al. (2012) found that ghrelin levels usually rise before a meal, then decrease afterward. Other scientists found that ghrelin levels were lower in women with BED than in women with similar BMIs but without BED (Geliebter et al., 2005). These varying results indicate that eating decisions are dictated by hunger or fullness, but researchers also believe that eating decisions may be triggered by emotion as well (Geliebter et al., 2005). Ghrelin has shown to be involved in eating habits, but more research should be performed on its direct link.

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Dopamine levels can affect food intake and hunger. Studies reviewed by Wang et al. (2011) found consistent results with dopamine's role in regulating food consumption through rewarding properties. They found that low dopamine activity could predispose an individual to overeat as a way of compensating for decreased dopaminergic activity. Those with BED share similar compulsive and impulsive behaviors with food. Some ingredients in palatable food (i.e., sugar and fat) can result in impulsive intake of food. This behavior can also induce the release of dopamine.

It is believed that investigating the interactions of neuromodulators and neurotransmitters with dopamine signaling pathways may reveal the cause of binge-eating behaviors concerning physiological needs (Bello & Hajnal, 2010). The same dopamine pathway events also occur in those with anorexia and bulimia (Bello & Hajnal, 2010).

Natural therapies have been recommended, in addition to the cornerstone behavioral and pharmacologic therapies, to help reduce stress and anxiety in those with BED. Natural therapies include nutritional and herbal supplements, acupuncture, yoga, meditation, and exercise.

St. John's wort is an herbal supplement used to reduce mild to moderate, but not severe, depression. It performs a similar function to that of an SSRI (Linde et al., 2009). St. John's wort helps boost serotonin levels in the brain that are responsible for sleep, mood, appetite, memory, and learning. Researchers, Linde et al. (2009), collected data from 29 trials (with a total of 5,489 patients) and concluded that St. John's wort was as effective as a prescription antidepressant, with few side effects. The side effects of St. John's wort are minor, but patients are advised to consult with a doctor before taking it, as this supplement can alter cytochrome enzyme function (Markowitz et al., 2003).

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5-Hydroxytryptophan (5-HTP) and tryptophan are serotonin precursors that reduce depression and anxiety. Tryptophan is also an amino acid found in animal and plant foods. Tryptophan balances nitrogen in the body and creates niacin and 5-HTP, which are essential in creating serotonin. Since the body uses 5-HTP and tryptophan to produce serotonin, these natural agents may have the benefits of decreasing depression, anxiety, and negative thoughts, and improving sleep. A meta-analysis was performed of 108 trials by Shaw et al. (2002) on the effectiveness of 5-HTP and tryptophan with depression. The findings and results in this meta-analysis suggested these substances are better than the placebo at alleviating depression (Shaw et al., 2002). Further research is needed, however, to evaluate the safety of tryptophan before it can be recommended for the treatment of BED (Shaw et al., 2002).

Serotonin deficiency is related to insulin resistance. When insulin is released from the pancreas, it helps other cells in the body take sugar from the bloodstream to feed the cells, thus decreasing blood sugar again (Richardson, 2009). However, before insulin is released from the pancreas, it is stored in secretory granules. These granules also store serotonin, which is released with insulin. Carbohydrates are found to be the preferred macronutrient for serotonin activation and satiety neurons stimulation in the hypothalamus (Liebowitz, 2012). Liebowitz (2012) performed an analysis of several studies regarding serotonin and eating disorders. She found that subjects with anorexia have a deficiency in serotonin. In subjects with BED, it was found that they have a disturbance in serotonin. In subjects with bulimia, it was found that they have significantly blunted prolactin responses to the serotonin agonists (Liebowitz, 2012). In conclusion, serotonin is affected subjects with different eating disorders.

SAMe is naturally found in the body, and the evidence suggests that it is effective as an antidepressant (Galizia et al., 2016). SAMe was only effective, however, for reducing

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depression in those who took it with escitalopram. Galizia et al. (2016) performed a meta-analysis on 108 trials using SAMe with placebo and SAMe with escitalopram. The results showed an increase in dopamine levels in the brain when SAMe was taken together with escitalopram. Another study performed by Murphy et al. (2014) was a randomized control trial on SAMe and placebo, but without escitalopram. The results showed a small decrease in depression. Further research is needed to determine whether SAMe can be used as a supplement for depression in those with BED.

Even though the natural agents discussed in this dissertation could be helpful to some individuals, patients are recommended to seek a doctor's advice before taking any of them.

Table 2 provides a comparison of the nutrition and herbal supplements discussed.

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Table 2

Supplements Tested for Binge-Eating Disorder

Name of supplement	Function	Recommended doses	Outcome	Risks
St. John's wort	Reduce depression	600–900 mg/day (divided doses)	A positive outcome in decreasing mild to moderate depression	Can alter cytochrome enzyme function (alter the clearance of medications)
5-Hydroxytryptophan	Reduce depression and anxiety	100–300 mg/day	A positive outcome in decreasing depression	No known risks
S-AdenosylMethionine	Reduce depression	400–800 mg/day (divided doses)	Only helps reduce depression when used in combination with escitalopram	One side effect reported was hallucination

Physical and mental therapies are beneficial for relieving stress and anxiety, improving body image and self-esteem, decreasing weight, and negative thoughts. Physical therapies include yoga, acupuncture, and meditation. In this dissertation, a study by McIver et al. (2009) was performed on yoga as an added beneficial treatment of BED. A group of 45 women participated in this study for 12 weeks: 25 of them participated in yoga, and 20 were wait-listed (did not participate in yoga). These women were 25–63 years old, all diagnosed with BED, and not overweight. Each participant's BMI was under 25. The yoga group had reductions in binge-eating and stress, and their physical activity increased significantly. Their hip and waist measurements decreased as well. The wait-listed group did not show improvements in binge-

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eating habits, stress, or weight. Hip and waist measurements were not self-reported. However, the outcome on yoga and BED did show improvements in weight and hip measurement. Further research should be performed on yoga and BED since there are not many studies on this topic. McIver et al. (2009) also stated that any physical activity can create positive benefits for the mind, body, and body weight. Other examples of physical activity are weightlifting, running, cycling, kickboxing, and Pilates.

Acupuncture has been shown to provide many health benefits for individuals with BED. The benefits of acupuncture are stress and anxiety reduction, balance restoration, craving control, and improved digestion (Wu, 2016). These benefits are important in the healing process of individuals with BED and are an added benefit to the three cornerstone treatments. Acupuncture therapy can be effective in minimizing depression and giving a patient a sense of control (Wu, 2016). Though there are no scientific studies to prove the effectiveness of acupuncture specifically for the direct treatment of BED, acupuncture is widely used in Chinese medicine to help with BED and other eating disorders because it speeds up the recovery of affected body systems caused by stress (Wu, 2016). When acupuncture is performed, certain points on the body become effective at helping with restoring balance, digestion, absorption, and metabolism, thus increasing energy in the body. The restored balance and new sense of control can aid patients in regaining their emotional and physical health, which may help individuals with BED control appetite and cravings better. Even though acupuncture is commonly used for pain relief, the treatment is based on its theory that illness or disease comes from imbalances in energy flow. Fine needles are inserted at target points on the body to correct these imbalances and restore them. For example, the lower leg (near the ankle) is a target point for gastrointestinal issues and irregular menstrual cycles (Wu, 2016). Wu (2016) stated that “acupuncture has both

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psychological and physiological effects”. As a natural therapy, however, acupuncture is not for everyone because some individuals may not like the discomfort of needles. A consultation is recommended to understand the procedure and the possible pain that may occur.

Meditation is another lifestyle intervention that can help with reducing stress and anxiety. Meditation is a practice in which an individual uses his or her mind to focus on a particular thought, object, or activity. This type of practice helps train the brain to achieve a clear, calm, and stable state. Regular meditation can help enhance the blood and oxygen supply to the brain and body and can result in the improvement of nervous system function and mood and a reduction of poor habits and negative thoughts (Kristeller & Hallett, 2007).

Kristeller & Hallett (2007) performed a 6-week study on 18 obese women that administered techniques on standard and eating-specific mindfulness meditation exercises. The goal of this study was to determine if meditation is helpful in reducing the frequency of binge-eating. At the end of the 6 weeks, the participants who remained in the study reported an improved sense of self-control. Binges decreased in frequency from 4.02/week to 1.57/week ($p < .001$), and in severity. The results suggested that meditation training may be an effective component in treating BED, but still needs further research since there are not enough strong studies on meditation and BED. In addition, meditation is considered safe and does not require equipment.

The evidence on environmental influences has been helpful. For example, if a parent in a household has BED, he or she will likely be concerned with the weight and appearance of other family members. It was reported by Allen et al. (2014) that children of mothers with a current or past eating disorder had significantly higher levels of global eating disorder symptoms and emotional eating than other children, and mothers with a current or past eating disorder reported

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significantly more concern about child weight than other mothers. Allen et al. (2014) assessed 221 mother-child dyads and concluded that this type of home environmental influence can cause eating disorders, depressive mood, and low self-esteem. Maternal concern about child weight was significantly higher than paternal concern.

Concerning home environmental influences, being in an abusive relationship can cause low self-esteem, body image issues, and a depressive mood (Hughes et al., 2017). For young children, any type of abusive relationship is called an adverse childhood experience (ACE), and can lead to issues in their adulthood. Hughes et al. (2017) performed a systematic review and meta-analysis in which five electronic databases for cross-sectional, case-control, and cohort studies were used for ACEs concerning eating disorders. The researchers found that relationship abuse in one's childhood years could cause substance abuse, mental health issues, violence, and weight issues in one's teenage or adult years.

Some individuals with both BED and ACEs resort to alcohol and drugs to mask their negative feelings. A review performed by Schreiber et al. (2013) on BED and substance abuse reported that those with BED have used 10 different classes of drugs. The authors also determined the following criteria for BED substance abusers: (a) the use of substances for a greater amount of time or in a greater quantity than intended; (b) an inability to reduce the substance abuse despite the patient's intent; (c) the creation by binge-eating episodes of more stress and the urge or craving to use more substances; (d) the substance use's interference with work, school, or home commitments; (e) a withdrawal of social or recreational activities due to substance use; and (f) the experience of withdrawal symptoms when trying to decrease the substance use. The authors concluded that childhood abuse could affect behaviors in adult years, where their dependence is on the properties of drugs, alcohol, and food. It was recommended,

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however, that further research on the severity of the illness be undertaken since many factors, behaviors, and psychological components are tied to ACEs and BED.

Khoury et al. (2020) focused on the devastating effects of childhood abuse (physical, sexual, mental, and emotional abuse). The authors touched on both sudden unexplained death syndrome (SUDS) and post-traumatic stress disorder (PTSD), which occur in those who experienced ACEs. SUDS can be caused by stress, trauma, or heart issues (Khoury et al., 2020). PTSD can be caused by traumatic life experiences. Both disorders can occur in infancy, childhood, or young adult years. Although their study was not directly focused on eating disorders, it did strongly suggest that traumatic childhood experiences could cause substance abuse (a compulsive behavior like binge eating). Substance-abuse counseling should be recommended to BED patients who have experienced ACEs and abuse alcohol or drugs. This is a vital process in addition to the three cornerstone treatments for BED. Moreover, the techniques of CBT are very similar to substance-abuse counseling techniques since CBT helps reverse compulsive habits. Substance counseling is administered in groups in which individuals can verbally share their traumatic experiences and learn the 12 steps to recovery and sobriety (WHO, 2020). The steps to recovery are free and involve a sponsor in helping to achieve and maintain abstinence from substance abuse. The program uses a spiritual approach in that each participant finds a higher power in their own way; it does not have to be a God. The success of the program depends on the individual attending regular group sessions, reaching out to counselors or sponsors when in need, and implementing the necessary steps for recovery (WHO, 2020).

Nutrition and diet therapy is another cornerstone therapy leading to the successful treatment of BED. Since one of the complications of BED is a poor relationship with food, it is suggested that certain steps be taken to successfully obtain a proper nutrition and meal plan

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(Kerbar, 2019). These steps include creating a better relationship with food, education on food shopping, eating more whole foods, setting up mealtimes for consistency in eating, and understanding that food should not be abused. Once these steps are developed, a formal meal plan will ensure better eating habits, fullness, decreased hunger, decreased bingeing, increased energy, and an overall healthier body. Though there is no specific evidence of the existence of therapeutic meal plans for BED, the articles in this literature from doctors and registered dietitians strongly recommend a meal plan containing mostly whole foods and complex carbohydrates. Whole foods are more filling and nutritious, and will not trigger cravings of high-sugar and high-fat foods.

Sugary foods and large meals can increase sugar cravings through blood glucose spikes. Glucose spikes could eventually cause reactive hypoglycemia (low blood sugar). During hypoglycemia, hunger increases and can provoke more binge-eating. Other symptoms of reactive hypoglycemia are confusion, headaches, blurred vision, irritability, weakness, dizziness, sweating, and shaking (Manzella, 2020).

Complex carbohydrates are good sources of vitamins, minerals, fiber, and antioxidants. Some examples of complex carbohydrates are potatoes, brown rice, quinoa, beans, legumes, peas, and grains (including oatmeal). Simple carbohydrates usually consist of different types of sugar and include processed foods—e.g., cookies, baked goods, candy, and soda—but also foods like white bread, white rice, and pasta. Simple carbohydrates are easily digested and rapidly absorbed, causing a spike in blood sugar. They give a quick boost of energy, whereas complex carbohydrates allow a person to maintain more physical energy throughout the day. Complex carbohydrates provide more energy to the body, more nutrients, and a long-lasting feeling of satiety.

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Karges (2015) agrees that normalized food and eating habits start with general meals and snacks that should be consumed throughout the day. A combination of psychotherapy and nutrition therapy can work together with scheduling and organizing the complicated life of a BED patient (Karges, 2015). Organization and consistency generally will lead to more success.

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Chapter 5

Discussion, Conclusions, Implications, and Recommendations

Discussion

The main focus of this dissertation was to shed light on BED, its complexity, and the variety of effective treatments for it. BED can affect a person of any age group, gender, ethnic group, or nationality. BED is a multifactorial condition resulting from (a) environmental factors, (b) genetic factors, (c) adverse childhood experiences, (d) stress and anxiety, and (e) hormone imbalances. All of these factors have been established as signs or indicators of BED and recognized as contributors to binge-eating episodes, depression, negative thoughts, withdrawal from social life, and low self-esteem.

Unfortunately, there is no single curative treatment for BED, but learning to manage and improve behaviors is key to recovery. Psychotherapy is highly recommended since individuals with BED have negative thoughts about themselves and low self-esteem. Some SSRI medications are needed for depressed patients. Other medications, such as Topamax, can help reduce cravings and hunger. Natural agents (i.e., vitamin and herbal supplements) can help with specific symptoms when taken together with psychotherapy or prescription medications. A nutritious meal plan will help decrease hunger, increase energy, and eliminate negative thoughts about food. Keeping physically active can help patients with weight loss, reduced binge-eating episodes, and increased self-esteem. Practicing other forms of wellness (e.g., meditation, yoga, or acupuncture) can increase energy, help create positive thoughts, increase self-esteem, and improve sleep.

Since BED has been examined for several decades, there is much documentation and observational evidence of both short and long-term recovery from the illness. Since the process

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of recovering from BED requires a lifestyle change and cognitive therapy, it must be practiced every day to succeed, given the severity of this illness. If an individual with BED deviates from the recommended lifestyle changes and cognitive therapy, old habits and traits of BED can return. To achieve long-term positive results from treatment, behaviors and habits must change consistently for the rest of one's life.

BED and other eating disorders seriously affect both physical health and psychosocial functioning (Eaton, 2019). As previously discussed, breaking the confines of BED requires participation in a multifaceted recovery process (Eaton, 2019). This process helps the individual with BED become confident enough to return to social engagement. In a meta-analysis by Eaton (2016) performed on various types of eating disorders, the 12 studies examined focused on the recovery process of those who have overcome their disorders. The goal of this meta-analysis was to identify the participants' overall thoughts on changing their lifestyles completely. Participants agreed that recognizing their disorder and its consequences constituted the first step to recovery. Many participants said they felt like prisoners of their feelings and thoughts and that gaining a sense of freedom was an incentive for them. Lastly, understanding their treatment and recovery process was another key to their success; one cannot progress if he or she does not understand the process.

Conclusions

The research showed that the medications responsible for weight loss and improved self-esteem are sertraline, citalopram, and topiramate (Crow, 2014). Finding the appropriate medication for each individual with BED requires the work of a qualified health professional. Treating BED with medication should be personalized concerning dosing and class, and

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combined with psychotherapy (Crowe, 2014). Addressing depression solely with medication while failing to treat the other symptoms of BED is an antiquated way of treating any eating disorder (Lakhan & Vieira, 2008). Prescription drugs alone have produced countless barriers to helping individuals manage BED cognitively while masking the other symptoms of BED (Lakhan & Vieira, 2008). New treatments for BED include psychotherapy, nutrition therapy, vitamin and herbal supplements, and physical activity, which have all been shown to be important components of BED treatment.

Psychotherapies for BED work differently for each patient as well, with cognitive-behavioral therapy (CBT) and interpersonal psychotherapy (IPT) being the most effective. CBT and IPT have been shown to target binge-eating and cognitive behaviors directly (Iacovino et al., 2012). Dialectical behavioral therapy (DBT) has shown promise in the treatment of BED concerning improving health and well-being but needs to be researched further since DBT does not target the major challenges of the illness (Iacovino et al., 2012). The evidence also showed that behavioral weight loss therapy (BWL) is a reliable treatment for weight loss but is not considered a specialty treatment for BED because it does not help with the major complications or symptoms of the illness (Iacovino et al., 2012). In conclusion, psychotherapy is an important intervention in the recovery from BED because it helps with overall cognitive thinking and reduces binge-eating episodes.

Overall, the trials, studies, and cohorts presented have all been peer-reviewed and fit the criteria of the research for this dissertation. All inclusion and exclusion criteria were listed.

The need for raising awareness of BED is crucial to recognize early signs and administer treatment in the early stages before symptoms worsen. Raising awareness of BED can be done at schools, workplaces, religious institutions, and competitive sports locations. Delivering basic

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facts on signs of abuse, symptoms of victims, and abnormal eating patterns are a beneficial start to educating the public. Some individuals with eating disorders are afraid to come forward, speak out, acknowledge their disorder, or are embarrassed about it (Krauss-Whitbourne, 2013). Krauss-Whitbourne (2013) stated that “self-esteem is the set of feelings one has about oneself, and, while low self-esteem is diagnosed in many patients with depression, it does not directly cause it”. Therefore, educating individuals who have BED is just as important as educating the public. For those afraid to speak up, BED hotlines should be available for immediate and anonymous help. Other types of BED awareness strategies should include a fact sheet, seminars in schools, weight control tips, hotlines for behavioral help, and proactive and therapeutic strategies.

In the future, BED research should involve more studies based on the limitations of BED. For example, some symptoms may not be recognized (or under-recognized) as associated with BED. The number of signs and symptoms associated with BED are broad and extensive, and this dissertation only indicates the most common and debilitating symptoms. In order to develop a more comprehensive review of symptoms, each symptom would need to be divided (and subdivided) and investigated.

Future BED research should also involve more studies on the diagnostic use of scales. For example, some studies in this dissertation include diagnostic scales such as Clinical Global Impression (the severity of the illness), Hamilton Rating Scale for Depression (HAM-D), Yale Brown Obsessive Compulsive Scale, Eating Disorder Inventory, Becks Depression, Inventory, Eating Disorder Diagnostic Scale, and State-Trial Anxiety Inventory. These scales should be an extension of self-reporting, questionnaires, and regular visits, rather than a primary position for BED diagnosis. A scale is an important tool in determining the patterns, processes, various

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measures, and variables researchers use in their study. Scales deliver more reliable information and results than self-reporting, questionnaires, and regular visits. Without understanding the concept of scales, one could not have a solid grasp of the data.

One scale that was not used enough in these studies is the Eating Disorder Diagnostic Scale, which is a 22-item self-reporting questionnaire designed to measure BED and is aligned with the DSM-IV diagnostic criteria. The scale is comprised of a combination of Likert ratings, behavioral frequency scores, and open-ended questions on weight and height (Stice, Telch, & Rizvi, 2000). The Eating Disorder Diagnostic Scale also measures the frequency of uncontrollable food consumption. Using a more useful scale, in combination with other testing methods, will fill in gaps and create a better understanding of each individual's position of BED.

More research on genetic factors will give a better understanding of how genes can play a role in BED. As of now, researchers are still investigating the major gene factor CYFIP2 in those with BED, but there is no available treatment yet. A treatment called memantine has been found in relation to NMDA genetics. Memantine has been successful in decreasing binge-like behaviors and food-seeking behaviors in rats. More studies on memantine should be performed on humans to find a dosage that is safe and effective.

Hormone therapy, metreleptin, showed improvement in weight loss, hormone balance, energy, and decreased hunger in patients so far (Muller et al., 2010). However, the weight loss in Muller's (2010) study was prominent in obese individuals only, therefore, more research should be performed on those who are not obese. There are ongoing studies for metreleptin and BED.

The supplements discussed in this literature showed some benefits for decreasing the symptoms of BED, which include anxiety and mild depression. Psychotherapy and other

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depression medications are strongly recommended in conjunction with supplements. St. John's wort showed the strongest outcome of all supplements for anxiety and mild depression. Further research is needed on 5-HTP and SAMe since both showed varying, but mostly positive, results.

Nutrition therapy is vital in the treatment of BED since certain foods can trigger binge-eating episodes. The research showed that processed foods (i.e., sugar, high fat, and high salt) can increase binge-eating episodes, as well as play a role in weight gain. Weight gain can lead to other health issues, such as diabetes, high cholesterol, and heart disease. Registered Dietician, Crystal Karges (Eating Disorder Hope, 2015), suggested eating more whole foods since they are more nutritious and will help keep one feeling fuller longer. Creating an eating schedule represents a start to good eating habits, reduced hunger, and reduced binging.

Omega-3 fatty acids were not discussed in this dissertation because it has not been shown to help with BED. It may, however, be helpful to include omega-3 fatty acids in future research since they have the potential to help with overall mood and cognitive thinking (Lakhan & Vieira, 2008).

The natural lifestyle therapies suggested in this literature are physical exercise, meditation, acupuncture, and yoga. Physical exercise provides many benefits to the body as a whole, including increased self-esteem and energy and improved body image. Meditation can be beneficial for relaxing the mind and body. Acupuncture was suggested to be helpful with reducing stress and anxiety. Yoga has shown to be helpful with stress reduction, anxiety, and binge-eating episodes in one study (Wu, 2016). Though only one study was available on yoga and BED, further research would be beneficial for those who seek natural therapies in conjunction with the cornerstone treatments.

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Implications

The research findings have several significant implications. First, increasing the social knowledge and awareness of BED has the potential to facilitate treatment and support early on in the illness stage, and/or to prevent it. In addition to the signs and symptoms of BED discussed here, BED can also cause additional negative life events, such as losing a job or friends. According to the Eating Disorder Hope Organization (EDH, 2020), individuals with BED can lose their jobs due to their depression, anxiety, stress from treatments, lack of motivation, and decreased socialization. Support groups can help individuals with BED become accountable and open up about their feelings and experiences.

A critical barrier to receiving psychotherapy is the cost. Affording the number of psychotherapy visits needed to recover from BED can be an issue for some individuals who are not insured. The lack of funds can make psychotherapy a short-term treatment for some patients, even though psychotherapy is recommended long-term for recovery. This can be a burden on BED patients (or any mental health patient).

Changing eating habits and creating a meal plan that works for each individual, however, this takes time and consistency. A registered dietician or a clinical nutritionist should administer the nutrition and meal plan, which can be another added expense for uninsured patients.

Support from loved ones and friends can help with motivation and consistency. With the many therapies needed to recover from BED, having a daily advocate at home to help organize or motivate a patient can play a major role in recovery. Without support from loved ones and friends, recovery and accountability can be difficult. Unfortunately, some individuals lack that support in their social networks.

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Since physical activity was suggested for those who are struggling with weight, confidence, and low self-esteem, an exercise program should be explained, developed, and implemented with consistency. Many fitness facilities offer a wide variety of programs, such as yoga, weight training, conditioning classes, and kickboxing. These facilities cost money and might be a financial strain for some individuals. Many companies offer gym reimbursement programs as an incentive to their employees. There are also many low-cost or free fitness programs online.

Concerning the prescription medications discussed, including SSRIs, most have been shown to help with depression and anxiety but not with the overall complications of BED. Prescription drugs can be costly if an individual does not have medical insurance. Even with medical insurance, there can be some out-of-pocket expenses such as co-payments.

Another complication in patients who use substances like alcohol and drugs may hide their feelings and thoughts, which can result in a more difficult time recovering from BED. Substance abusers must add an extra treatment (substance-abuse counseling) to their cornerstone treatments. Binge-eating is a compulsive behavior (as is substance abuse), which makes recovery much longer for these individuals.

Since BED is the most common eating disorder in the United States (more prevalent than anorexia nervosa and bulimia nervosa), it must be publicly addressed. About 3.5% of adult women and 2% of adult men have BED (NIH, 2020). For men, BED is more common during mid-life (ages 45–49). For women, BED starts mostly in early adulthood (ages 18–29). About 1.6% of teenagers are affected by BED (NIH, 2020). This will continue to grow given the statistical trends. For example, 8% of Americans now have BED, but in 2013 only 3% of Americans were diagnosed with BED. Surprisingly, BED is more common than HIV, breast

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cancer, and schizophrenia (NIH, 2020). A concern is how many people who are not diagnosed with BED (but actually have it), or who are wrongly diagnosed. Therefore, the percentage of those with BED in the United States could be higher.

Proposed Action Steps

At present, there is no universally standard or accepted treatment for BED. Because of its complexity, BED requires a personalized and comprehensive treatment plan that includes psychotherapeutic interventions, medical monitoring, nutritional counseling, possible endocrinology, and medication (when appropriate). This integrated approach to the treatment of BED should include the professional skills of licensed psychotherapists, endocrinologists, physicians, and dieticians or clinical nutritionists, as well as substance abuse counseling if needed.

Staying in one's treatment and program is vital to recovery. Any patient, at any time, can deter from their newly-taught lifestyle if they skip or stop treatment. Consistency is the key to long-term recovery. The following are the proposed action steps in the treatment of BED:

1. **Psychotherapy:** Psychotherapy can vary by patient, depending on the severity of the illness and the symptoms. Psychotherapy helps the patient take control of his or her actions and feelings. The goal is to eliminate negative actions and feelings.
2. **Medication (if needed):** Medication and dosage can vary by patient, depending on the level of depression, body weight, binge-eating episodes, and behavior issues. Some medications used to treat BED are anti-depressants, some are appetite suppressants, and some help control obsessive behaviors.
3. **Behavioral Weight Loss Programs (BWL):** Though this type of therapy is considered psychotherapy and weight loss, it could be a beneficial addition to a

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patient's treatment program since many BWLs are now medical-based weight-loss programs developed by doctors. Weight-loss programs address controlling the overall diet and craving, and learning how to eat better long-term. A supervised medical weight-loss program can be successful in conjunction with another psychotherapy treatment (preferably CBT). The patient must follow through with the plan to succeed. Consistency is highly recommended.

4. Nutrition therapy: Nutrition therapy is needed to educate the patient on nutritious foods, whole foods, foods that will help them feel fuller, foods that will increase energy, and foods to control weight.
5. Hormonal treatment: An endocrinologist may be needed if the patient suffers from hormone imbalances from BED or from being underweight, which can make the menstrual cycle irregular or cease completely. An endocrinologist will diagnose the patient and help prescribe the best method or treatment to bring hormones back to a balanced state.
6. Substance-abuse counseling: Substance-abuse counseling may not be needed by every individual with BED. It is strongly recommended, however, for those who resort to alcohol or drugs to deal with their feelings of prior mental, emotional, or physical abuse. This abuse could have come from a loved one, a teammate, a boss, or a co-worker. It is imperative to learn how to replace those feelings and habits with something positive and healthy.
7. Physical activity: Physical activity is not a cornerstone treatment for BED but is recommended for overall physical and mental health. Physical activity can help

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an individual lose or maintain weight. In addition, other benefits are increased self-esteem, body image, strength, and energy.

8. A strong support system: Having a strong support system from family and friends is vital for treatment consistency. A strong support system can bring feelings of comfort and motivation to the patient. The treatment of and recovery from BED can be overwhelming to individuals, so a strong support system helps the patient remain confident, consistent, positive, and successful.

Implementing a Meal Plan

There are several ways for individuals with BED to incorporate a healthy meal plan into their recovery process. The first step is to avoid trigger foods, which are foods that give the patient a sudden urge to binge (Kerbar, 2019). Trigger foods can be sugar, processed foods, high-fat foods, salty foods, or savory foods. Food restriction could also cause bingeing, since hunger is increased substantially when not eating regularly enough.

Incorporating whole foods into the diet can create a feeling of satiety (Kerbar, 2019). For example, eating popcorn may not be filling and could result in overeating. Whole-grain toast or oatmeal, however, are more filling foods and are less likely to trigger cravings. Whole foods also provide an individual with more nutrition (e.g., protein, vitamins, minerals, antioxidants, and fiber).

In addition to a personalized meal plan, an individual with BED must accomplish certain stages of change to sustain new food behaviors and habits (Kerbar, 2019):

1. Begin each day by eating a balanced breakfast rich in protein foods. This will help keep the stomach full and decrease cravings and urges to overeat or snack.

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2. Do not think of your daily food consumption as a diet. Think of food as a healthy habit for your body, not a way to punish or reward yourself.
3. Do not eat alone. Try to eat with family and friends. Eating alone may trigger memories of binge-eating in private.
4. Do not skip meals or go without eating for a long period of time. Hunger can trigger senses and decrease blood sugar, which could cause an individual with BED to eat anything they can find and to eat until complete satiety.
5. Listen to the body if it is hungry. Feed the body with whole and nutritious foods that will increase energy and satiety.
6. It may help to keep specific times for meals and healthy snacks. Getting the body onto an eating schedule will help decrease hunger and ensure nutritious food intake.
7. Exercise and keep active every day. Exercise and physical activities will help replace feelings of low self-esteem, increase energy, and take away from the time spent thinking about food and binging.
8. Learn to eat mindfully. Tasting good food (and feeling good about the food choices) will help boost feelings about yourself. Mindful eating is an effective tool for eating disorders and will create a better understanding of overall good nutrition.
9. Include protein-rich foods throughout the day because they keep you full longer. Individuals triggered by high-sugar carbohydrates will benefit from a protein-rich meal. Protein-rich foods are meat, fish, yogurt, nuts, seeds, and tofu. Fiber-rich

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foods are filling as well. Fiber-rich foods include fruit, vegetables, beans, grains, legumes, and potatoes.

10. Find deviations to food when not hungry. If eating out of habit or emotion is common. Examples of deviating from food are going for a walk, calling a friend or sponsor, do a puzzle, read a book, exercise, or work on a hobby. Some health professionals may suggest writing down your feelings in a journal. Carry healthy snacks when leaving the house. This will prevent stopping at a deli-type place to buy junk food.
11. Know the relationship between your mind and your symptoms. Know when your mind is triggered and when symptoms are stimulated by it. For example, watching a movie might trigger the urge to munch on snacks. Find a way to combat that urge. Chew gum, drink hot tea, or delegate a healthy food option for movies only (e.g., fruit or yogurt).
12. If you have a bingeing episode, do not think you failed. Recovery is a learning process, and there might be times of weakness. Turn those weaknesses into strengths through the daily practice of your new habits and a new way of thinking.
13. Do not look in the mirror often to analyze yourself. Do not get on the scale often. Do not put yourself down. Learn to love yourself by taking care of yourself.

Meal plans should always be constructed and recommended by a registered dietician or clinical nutritionist who specializes in eating disorder recovery (Karges, 2015). The following is a sample healthy meal plan for BED patients:

- Breakfast: two eggs (any style) and one slice of whole-grain bread
- Mid-morning snack: Fruit or a homemade smoothie

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- Lunch: Chicken, sweet potatoes, and a small salad
- Mid-afternoon snack: Yogurt with some nuts
- Dinner: Salmon, brown rice, and vegetables
- Evening snack: Plain oatmeal with ground cinnamon, or carrot sticks with hummus

In addition to having a long list of therapies and well-being plans, raising awareness of BED is critical. The research in this literature illustrates many reasons why individuals with BED often fail to receive proper treatment and support. Ways to raise knowledge and awareness of BED include:

1. The general population has limited knowledge of BED and will not recognize its signs, symptoms, and behaviors. It is suggested to bring BED education and awareness to schools, religious communities, government websites, and healthcare facilities. Pamphlets and brochures on BED facts should be accessible at healthcare offices as well.
2. Individuals with BED may be reluctant to acknowledge or discuss their eating disorders. School guidance counselors and healthcare professionals can be trained to recognize signs and help an individual with BED feel comfortable asking for help.
3. Increasing resources for individuals with BED will help them find support and understanding. For example, creating local hotlines and distributing BED informational pamphlets in the community can offer much help and support.
4. Treatment for BED (psychotherapy, group therapy, medication, a dietician/nutritionist, and an endocrinologist) can be costly if the patient does not

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have medical insurance. Fundraisers for individuals with BED can be established at local community centers or online. The money raised can also help with BED screening. A patient must be diagnosed with BED before receiving treatment.

Raising awareness in our local communities is a strong start to educating the public on BED facts and solutions, but including awareness of BED on America's National Healthcare Agenda would be a greater facilitator to education. The following plans and strategies can be implemented through our national healthcare agenda:

1. Medical evaluations must include screening assessments that can help underage patients with a diagnosis of BED. Some underage individuals do not know, or cannot admit they have the illness. Even some adults cannot admit they have it. Screening can take the form of a questionnaire about the signs, symptoms, and behaviors of BED. Bloodwork is sometimes performed to check hormone levels or deficiencies if specific symptoms are present, such as fatigue, tiredness, and irregular periods (Grohol, 2019).
2. The American national healthcare policy should include more medical coverage for mental-health treatment. Few medical insurance plans cover mental-health treatment, which is one of the cornerstone treatments of BED. If an individual with BED cannot afford mental health, then recovery is less likely to occur.
3. More research on the genetic factors of BED should be encouraged and funded.
4. More research on the hormonal influences and potential hormone treatment should be encouraged and funded (i.e., leptin, ghrelin, and insulin).
5. Effective biomarkers or environmental factors can be further investigated and established for BED.

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My personal goal for raising awareness of BED is to bring the facts to colleges and universities.

Here is what I propose:

- Research organizations and foundations who support, sponsor, and raise awareness of BED to see if they can offer their expertise and advice. Researching mental health foundations will benefit this project as well.
- Create a BED committee on campus. Send out emails and flyers about who would be interested in joining the awareness team.
- Once the team is developed, have a kick-off meeting to present facts, come up with ideas, create a budget, and delegate tasks to each committee member. Tasks will include a marketing person, a research person, a treasurer (to stay within budget), a writer or blogger, an event planner/scheduler, and those who will go out in the field to deliver BED facts and information.
- Have a cake sale (or anything that does not cost much) to raise money for any materials needed for the BED committee.
- Create brochures using the university's computers and printers.
- Create a calendar of events (i.e., for awareness seminars and workshops).
- Create a school hotline to help those with BED find the appropriate help, guidance, and doctors.
- Schedule a time slot on the university's radio station (if applicable) to speak about BED.
- Write an article in the University's newsletter about BED.
- Have weekly follow-up meetings on progress (or lack of), new ideas, and updates on expenses.

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- Continue to recruit volunteers on the committee.

The strategies listed are recommended for current and prospective research as part of an action plan to support a more efficient, therapeutic protocol for individuals with BED.

Therefore, continuing the research and implementing these proposed action plans have the potential to improve the quality of life in those with BED, while further illustrating the need to increase awareness. Adding mental health to healthcare insurance coverage would give individuals with BED a higher chance of recovering. Improved screening for BED and early detection of symptoms would decrease the level of debility.

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